FOUNDRY

A PENTON PUBLICATION

JULY 1960

CASTING THE ROLLS-ROYCE V-8 ENGINE

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New GE Foundry Produces Large Steel Castings
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How To Cut Noise in the Foundry Cleaning Room
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An announcement

of importance to foundrymen

seeking improved

cupola operations

Higher yields of strong, dense, consistently more machinable castings are possible through the use of *new* Ferrocarbo® Briquettes...the only cupola deoxidizer containing an expanding agent, catalyst and a slag activator.

The unique expanding agent causes disintegration of the briquettes and assures maximum distribution of their active ingredients at temperatures which provide optimum reaction with the molten metal and slag.

The addition of a catalyst to the briquette promotes faster and more complete reaction of the briquette's active ingredients.

The slag activator lowers the viscosity of the slag which assures rapid and uniform distribution of the briquette throughout the slag, and promotes the absorption of the sulfur from the iron.

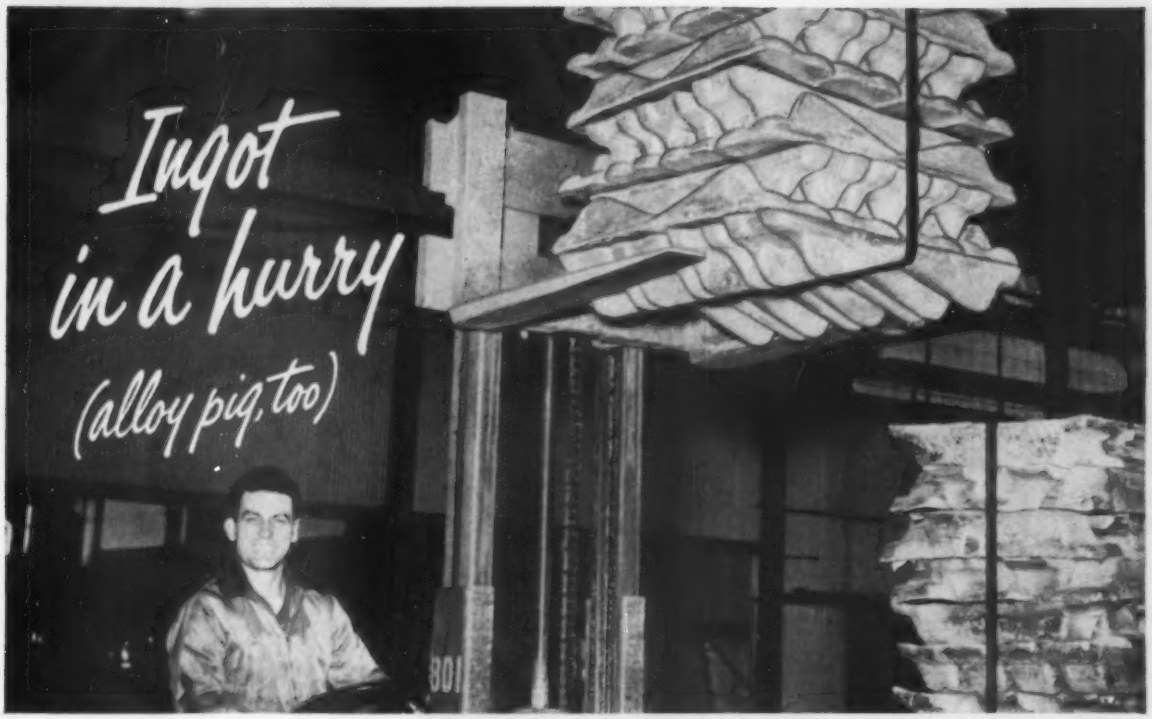
Ferrocarbo Distributors—Kerchner, Marshall & Company,
Pittsburgh • Cleveland • Buffalo • Detroit • Philadelphia
Birmingham • Los Angeles • Canada
Miller and Company, Chicago • St. Louis • Cincinnati

new **FERROCARBO** *briquettes*

by **CARBORUNDUM®**

H 64-03

Circle 551 on Page 53



...get fast delivery on any aluminum alloy pig or ingot from your REYNOLDS INGOT DISTRIBUTOR

The old cliche, "time is money" really hits home when your casting operation is held up for want of metal. But if that metal is aluminum, there's no problem. Just call your local Reynolds Ingot Distributor.

Chances are, the metal you need—in the right alloy and size will be at your doorstep in 24 hours or less from your Reynolds Distributor's stock. Or he can get you any casting alloy for prompt shipment from Reynolds plant inventory.

Your Reynolds Ingot Distributor is geared to deliver the pig and ingot you need *fast.* Call him.

Reynolds Metals Company, P.O. Box 2346-FK, Richmond 18, Virginia.

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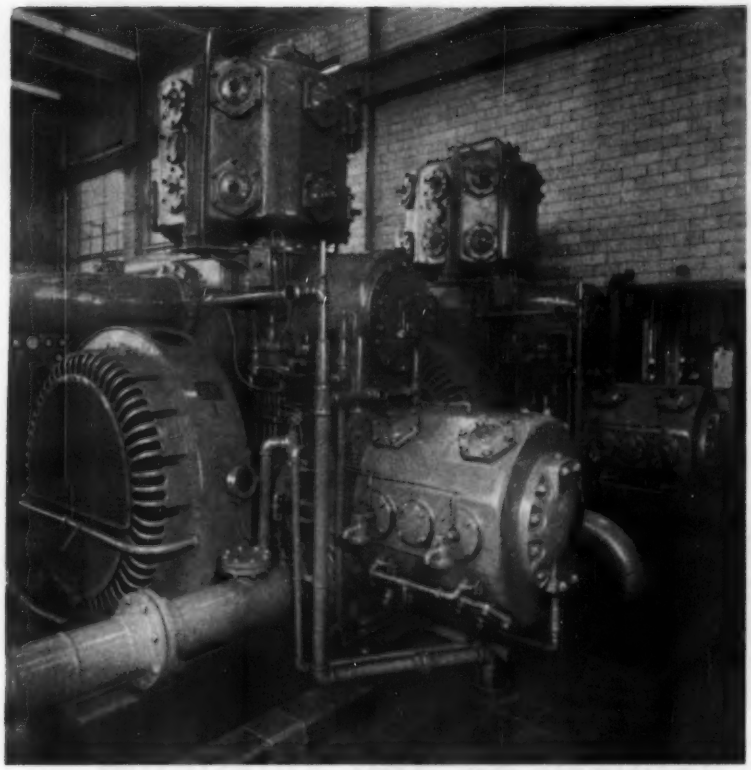
Atlas Metal Co., 8550 Aetna Road, Cleveland 4, Ohio • **Barth Smelting Corp.,** 99-129 Chapel Street, Newark, N. J.
Bay State Refining Co., 8 Montgomery Street, Chicopee Falls, Mass. • **W. F. Jobbins, Inc.,** North Lake Street Rd., Aurora, Ill.
Morris P. Kirk & Son, Inc., 2700 S. Indiana St., Los Angeles, Calif. • **Milward Alloys, Inc.,** Lockport, N. Y.
Milwaukee Chaplet and Supply Corp., 8656 W. National Ave., Milwaukee, Wis. • **Richards Corp.,** 356 Commercial St., Malden, Mass.
Sipi Metals Co., 1720 N. Elston Ave., Chicago 22, Ill. • **Sonken-Galamba Corporation,** 2nd and Riverview, Kansas City, Kansas
Nathan Trotter & Co., 36 N. Front Street, Philadelphia 6, Pa.

REYNOLDS ALUMINUM

Watch Reynolds TV Shows: "Bourbon Street Beat" and "Adventures in Paradise"; and, resuming in October, "All Star Golf"—ABC-TV

The Finest Products Made with Aluminum are made with REYNOLDS ALUMINUM



IN I-R COMPRESSORS,

TIME TELLS

THE DIFFERENCE

In these two XLE compressors, 21 Channel Valves have operated

45,482 HOURS

with no parts replaced!

The two Ingersoll-Rand XLE air compressors shown above are installed at a large midwestern automotive plant. They were started up in May, 1951, and at this writing have totalled 45,482 hours, mostly at 16 to 24 hours a day.

Of the 28 Channel Valves (14 per unit), 21 have operated full time with *no repairs*, merely being cleaned once a year. Each of the other seven valves had only one channel and spring replaced in all this time, during the scheduled inspection period. And all the valves are operating with their seat plates still on the first side—when the plates are turned over, their life will be doubled.*

The *extra value* that's built into every type of Ingersoll-Rand compressor pays off with *long-run economy*. Reduced maintenance and attention, over many years, mean long-range savings in the cost of air power. Ask your I-R representative for more information on the world's most complete line of compressors, from 1/2 to 7500 hp. Call him now.

***Only I-R compressors have Channel Valves**

Known for high efficiency, quiet operation and exceptional durability. Entirely different. Each valve is a combination of rigid stainless-steel channels and bowed leaf springs, with trapped-air spaces which cushion action, prevent impact.

Ingersoll-Rand

11 Broadway, New York 4, N.Y.

The World's Most Comprehensive Compressor Experience

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July 1960
Volume 88—Number 7

FOUNDRY
A PENTON PUBLICATION

Larger than average steel castings are being produced in shell molds by American Steel Foundries at Indiana Harbor, Ind. (see Page 81). This view shows the drag of a large brake beam mold being pasted. The cope, which is hanging above, then is lowered automatically onto the drag.

Technicians Needed 63
Editorial—By FRANK G. STEINEBACH

Casting the Rolls-Royce V-8 Engine 64
Aluminum sand castings in the new Rolls-Royce V-8 engine include cylinder heads, crankcase (or block), clutch housing, and steering box. Here's the full story on the cylinder head and crankcase castings—By ALAN S. BRETT

New Foundry Makes Large Steel Castings . . . 72
General Electric Co.'s new steel and iron foundry in Schenectady, N. Y., makes steel castings ranging in weight from 35,000 to 65,000 lb. To date, all production has been in steam turbine shells—By ROBERT H. HERRMANN

How To Cut Noise in the Cleaning Room 76
It has been shown that foundries can cut the general noise level in a cleaning room at a reasonable cost. Here is a detailed presentation of the steps involved in reducing noise at one foundry—By W. O. HANSON

Casting in Zircon Sand Shell Molds 81
At its Indiana Harbor Works, American Steel Foundries is producing 800 tons per month of steel castings which weigh from 15 to 300 lb. Castings are produced in zircon sand shell molds—By ROBERT H. HERRMANN

Gating Steel Castings (Part II) 86
This concluding article on gating steel castings discusses metal cleaning devices and factors which determine size, shape, and placement of gates. It is tenth in a series on gating and risering—By CHARLES W. BRIGGS

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Good quality, diffuse lighting for each molding station at Buckeye Iron & Brass Works, Dayton, Ohio, has reduced rejections—By J. L. TUGMAN

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Donations of new equipment by ten companies provide Auburn with one of the most modern metallurgical foundry laboratories in the South

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Quick-photo data recording system has saved manhours and reduced scrap at I-T-E Circuit Breaker Co., Greensburg, Pa.—By ARTHUR MUSGRAVE

The Sandman Says 153

Complete sand control may represent an impossible ideal. As progress is made, sights are raised to more distant targets—By H. E. HENDERSON

AFS Congress Technical Reports 158

These reports conclude our resumes of technical sessions at the 1960 AFS Show and Congress. Sessions covered this month include Heat Transfer, Solidification, Patterns, Fundamental Papers, Education, Sand, Steel, Gray Iron, and Diecasting and Permanent Mold. Others were covered last month

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Intermittent operation of a small cupola can pose some real problems. Charlie explains how to hold a consistent coke-iron ratio—By C. W. AMMEN

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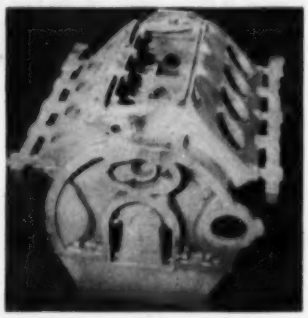
THE EDITORS' WORKSHOP

CRANKCASES: Ever hear of the Rutenber Motor Co.? The average person who assumes that use of aluminum castings in automobile engines is a recent development will be surprised to learn that Rutenber was casting aluminum crankcases at its Logansport, Ind., foundry nearly 50 years ago.

The lead article of our March,



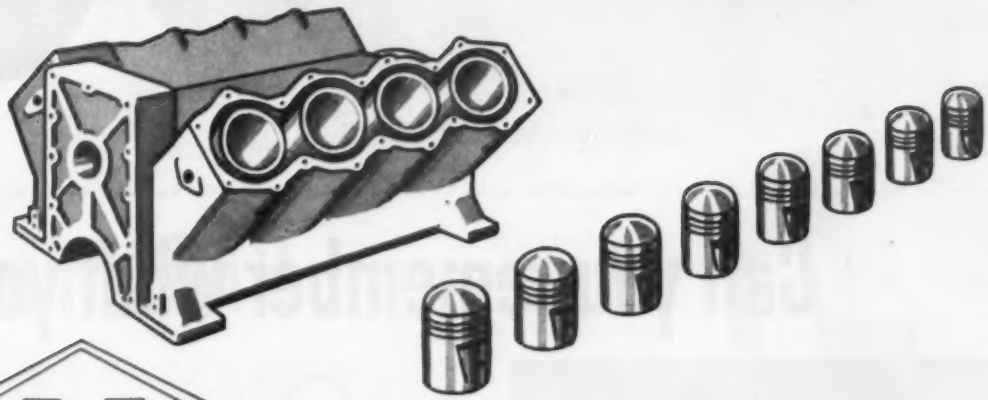
1913, issue described production of these castings for four and six cylinder engines. Methods used make an interesting comparison with those employed by Birmingham Aluminum Casting (1903) Co. Ltd. to cast the crankcase shown here for the Rolls-Royce V-8 (see Page 64).

Rutenber molded its crankcases by hand on the floor from metal patterns. One molder and a helper made eight molds a day. Interestingly, the finished weight of a four-cylinder casting was 56 lb, exactly one-half the weight of the Rolls V-8 crankcase.

THE SANDMAN: We welcome the return of Harold Henderson's column (Page 153). He credits the move to "the hope that some foundryman might be aroused from his apathy long enough to at least attempt some reforms."

MOISTURE: Every foundryman recognizes the importance of the moisture variable in molding sand. How radically moisture can affect sand properties will be shown next month in an article describing tests on this subject.

From pistons to engine blocks...



PMD

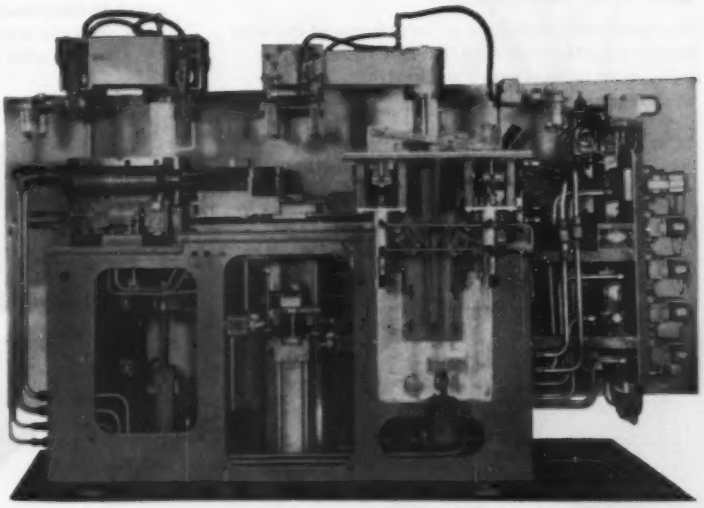
Automated Molding Equipment increases production, lowers costs

The designing and building of special automated molding equipment is an important part of the work at Permanent Mold Die Co. Typical of the equipment that PMD has developed for industry is this Automated Piston Molding Machine.

This machine incorporates the advantages of metal molds and cores, manual or automatic operation, and adaptability to various sizes of pistons. It has increased the rate of piston production almost 600%.

The automatic cycle on this particular machine includes insertion of dimension-control bands into the mold, assembly and disassembly of molds and cores, and transfer of completed pistons to customer's chute or belt conveyor. These PMD machines are designed to operate in groups of two, utilizing a single operator. The operator can pour at one machine during piston solidification at the other. These machines are also adaptable to automatic ladling. Most of the processes of this machine are hydraulically actuated and all the electric, hydraulic, and pneumatic functions conform to Joint Industry Conference Standards.

The machines developed and built by Permanent Mold Die Co., can produce small parts such as pistons, as well as large automotive aluminum castings. This equipment is developed to your specifications, to meet your particular needs.



PMD automated molding equipment offers you a wider production potential at relatively low cost. Investigate its advantages for your operation.

WRITE TODAY FOR DESCRIPTIVE BROCHURE

PMD

PERMANENT MOLD DIE COMPANY

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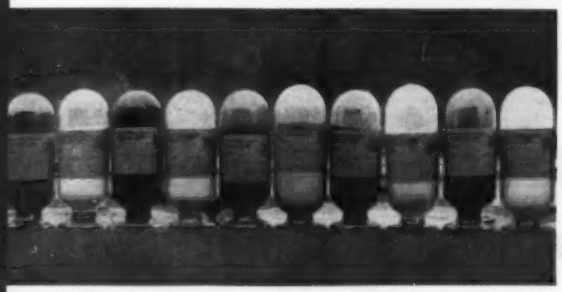
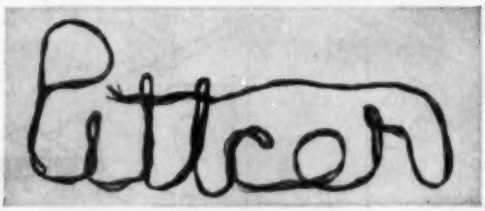
Who aimed straightest

Can you remember what you saw



HOW MANY ADM WASHES CAN YOU REMEMBER?

Ten types where exhibited as an example of the wide variety available from ADM. Actually there are many more to meet your most exacting wash requirements.



REMEMBER THE FIBER GLASS ROPE THAT CHANGED INTO CORE WIRE?

It spelled its own name to prove its flexibility . . . to show how it could be formed into intricate shapes . . . to emphasize its wire-like rigidity after exposure to heat.

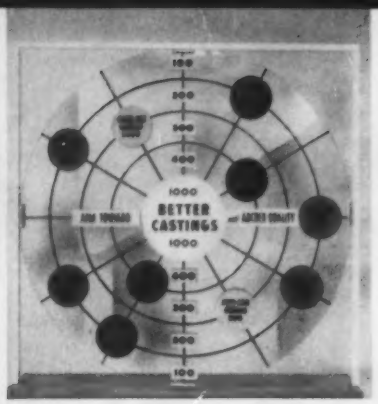
REMEMBER THE CORE THAT LOOKED LIKE A TUBA?

Pohlman Foundry Co., Buffalo, shipped core and casting to Philadelphia as living proof that with CHEM-REZ, ADM's new chemically-reactive resin, superior cores could be made in minutes . . . entirely without baking.

REMEMBER THE ADM "WEIGH-BUGGY"?

. . . maneuverable hopper on wheels that makes batching and hauling a cinch.

in Philadelphia?



If you have received a game of darts in the mail you are among the 100 visitors who scored highest on this plastic target at the Foundry Show. Remember?

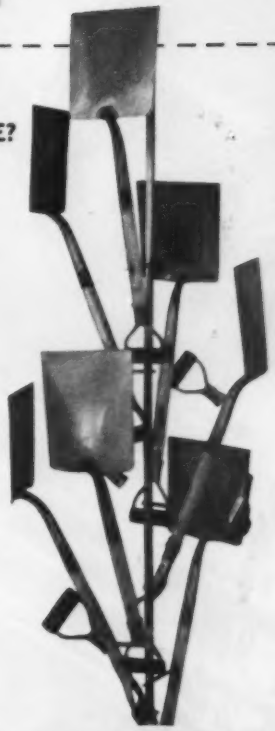
in Booth 1204?

REMEMBER THE YELLOW ARCHER CAPS?

. . . a reminder to aim toward better castings with Archer Quality Products.

REMEMBER THE SHOVEL TREE?

Its "branches" were ADM-Federal Molders' Shovels forged from a single steel bar; its "golden fruit", bronze handles with special rubber pein grips made for safe ramming.



REMEMBER THE LINOIL DRUM WITH THE SLOT IN THE TOP?

. . . where your request for more detailed information was dropped? (No oil in the drum!) If you haven't yet heard from your ADM Representative, look him up in the yellow pages and ask him where he's been.

REMEMBER THE "PERFECT TRIO"?

They worked 24 hours a day at the show to demonstrate how

(1) Green Bond Bentonite
(2) Crown Hill Sea Coal
(3) Archer Sand Stabilizer

work together in your foundry to produce controlled quality castings with pattern-true finishes.

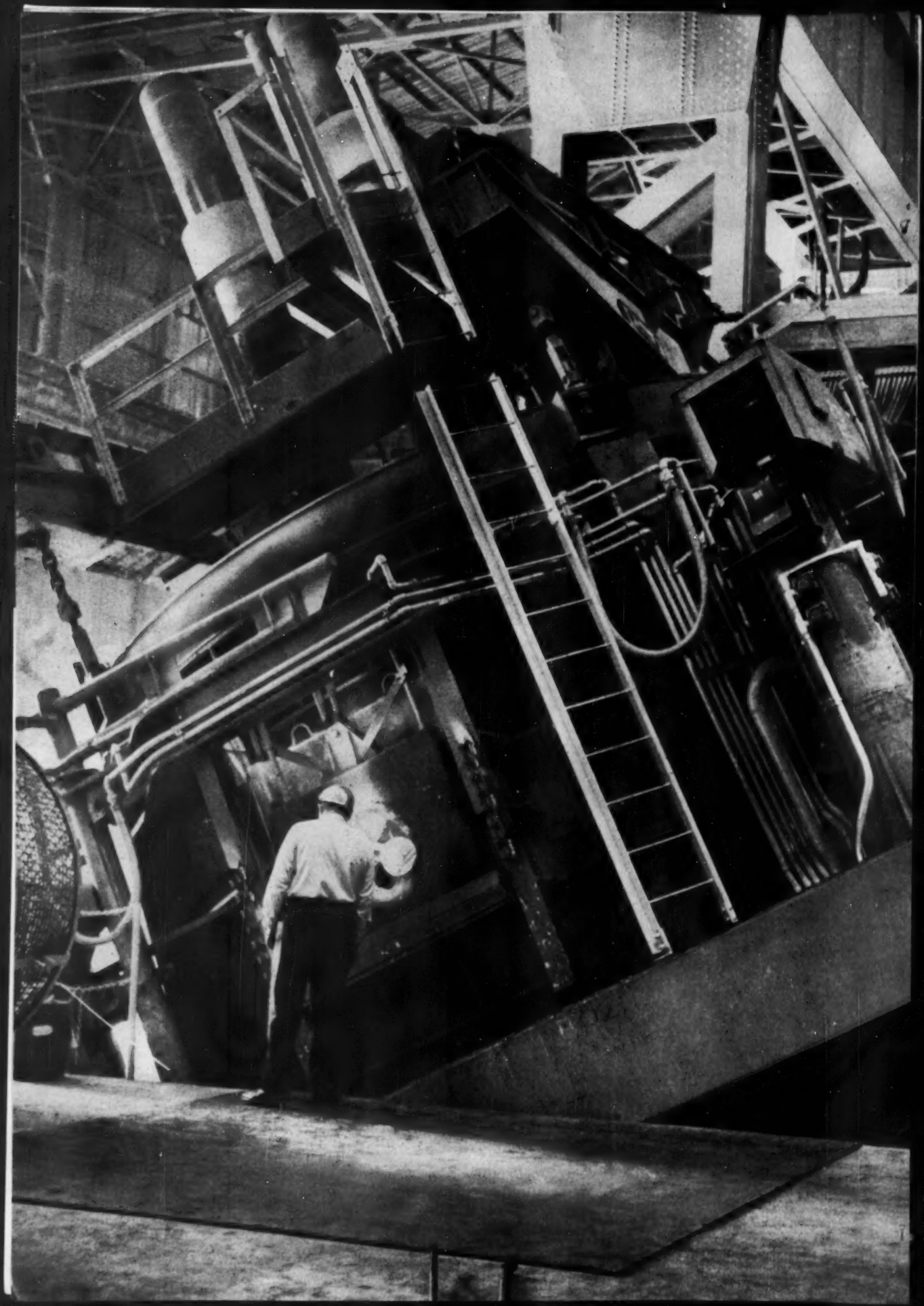
REMEMBER WHERE YOU SAW THESE THINGS?

It was in Exhibit No. 1204, the convention headquarters of Archer-Daniels-Midland Company, Federal Foundry Supply Division, 2191 West 110th Street, Cleveland 2, Ohio.

Circle 558 on Page 53

DID YOU SEE THE ARCHER?

He goes wherever ADM goes . . . symbolizes ARCHER QUALITY.



This Heroult Electric Furnace does the most efficient steel melting job at Lukens Steel

Two years ago, Lukens Steel Company installed this 20-foot diameter Heroult in their Coatesville Plant. It's a standard Heroult top-charge, swing-roof furnace with a nominal capacity rating of 100 tons. In almost continuous operation since installation, producing ordinary carbon and low-alloy steels, the Heroult's performance has proved the matchless efficiency of electric melting.

The Heroult is 100% mechanically operated. All movements are motor-driven gear mechanisms. This reduces maintenance problems, and permits your own maintenance crew to keep it performing with a minimum of effort. The Heroult has other features such as cage-type shell construction, independently supported operating mechanism, and water-cooled skewback roof ring. They all help to make the Heroult the finest electric melting furnace available.

Heroult Electric Arc Furnaces are available in shell diameter sizes from 7'0" up, and with a rated charge capacity from 4 tons to over 200 tons. You can select door-charge or top-charge swing roof type. We'll also furnish special induction stirring equipment, duplexing arrangements, and furnaces for melting of copper and nickel.

American Bridge has the facilities and the technical know-how to handle a complete melt shop installation. This includes design, construction and installation of machinery. For complete information, get in touch with the contracting office nearest you. Or write to our Pittsburgh Office.

USS and Heroult are registered trademarks

American Bridge Division of United States Steel

General Offices: 525 William Penn Place, Pittsburgh, Pa.
Contracting Offices in: Ambridge • Atlanta • Baltimore • Birmingham • Boston • Chicago • Cincinnati Cleveland • Dallas • Denver • Detroit • Elmira • Gary • Harrisburg, Pa. • Houston • Los Angeles Memphis • Minneapolis • New York • Orange, Texas • Philadelphia • Pittsburgh • Portland, Ore. Roanoke • St. Louis • San Francisco • Trenton • United States Steel Export Company, New York

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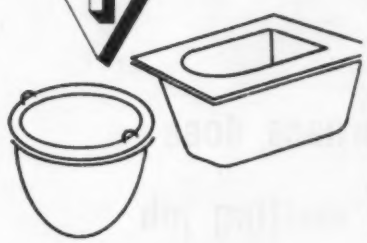
SPECIFY

TIFFIN QUALITY

"Mark of Quality"



MELTING POTS

There is

A TIFFIN FOUNDRY Quality Melting Pot for all Non-ferrous Metal.

SPECIAL SERVICE TO DIE CASTERS—NOZZLES, PLUNGERS, DIE BASES, THERMOCOUPLE TUBES, BAR STOCK AND POTS.

Custom castings of goosenecks and miscellaneous parts.
SEND DESCRIPTION FOR COMPLETE INFORMATION

- **LONGER LIFE—The quality iron used in our products is especially engineered for its heat and erosion resisting qualities.**
- **REAL ECONOMY—Pound for pound of melted metal, it costs less when you use Tiffin Foundry Quality Pots.**
- **SPECIAL POTS available. Send us your specifications.**
- **OVER 50 YEARS EXPERIENCE in the manufacture of quality pots and die equipment.**

SPECIFY the pot with the trademark of quality—they are engineered to last.

THE TIFFIN FOUNDRY, INC.
TIFFIN, OHIO

Circle 561 on Page 53

With the Editors

Symington Advertised: Associate Editor Jack Miske recently attended a Washington meeting of the Society of Business Magazine Editors at which Sen. Stuart Symington of Missouri was a luncheon speaker. Senator Symington also, of course, is a candidate for the Democratic nomination for president.

In his talk, the senator reminisced about his first job, which was in a foundry, and remarked that he had made his share of copes and drags. He went on to relate that in 1927 he and his wife had scraped together the cash to buy a front-cover advertisement on FOUNDRY for Eastern Clay Products Inc., which he had founded to sell Revivo Bond, a product to renew used natural sand

which is still marketed today by Eastern Clay Products Dept., International Minerals & Chemical Corp.

Another member of Eastern Clay then was Norman J. Dunbeck, now vice president of International Minerals and current president of AFS.

If Senator Symington's campaign is successful, we'll have our first ex-foundryman president!

—o—

A Vote for: Over at the booth of Keokuk Electro-Metals Co. division of Vanadium Corp., during the Philadelphia show, Princess Wenatchee (a good-looking paleface) was passing out buttons in the campaign for Chief Keokuk, who was running for something but nobody seemed to know just what. The but-

tons carried the stirring message around the circumference that "A vote for Chief Keokuk is a vote for Chief Keokuk is a" (how can you get out of this?).

The illustration shows the princess pinning the campaign button on Terry Brennan, assistant to the vice president, Miller & Co., sales representative of Keokuk.

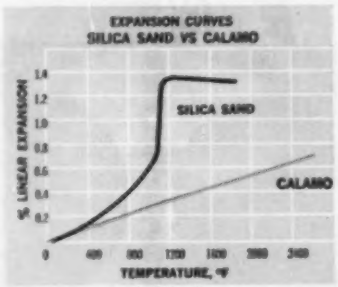
—o—

Harry Found: They finally tracked down "Handlebar Harry" in National Engineering Co.'s contest to find the oldest Simspon mixer in use. He turned out to be

William Phillips, superintendent, Dominion Coal Co. Ltd., Glace Bay, Nova Scotia. The old mixer was

FOR BETTER METAL CASTING... HARBISON-WALKER REFRACTORY MOLD MATERIALS

Calamo for investment molds



CALAMO, one of the extensively used Harbison-Walker products for molding, is an alumina-silica refractory of optimum sizings for various molding mixtures. Its fusion point is 100°F. higher than that of normal silica sand mixes.

The chart shows the exceedingly desirable expansion curve of CALAMO compared with that of silica.

CALAMO, used as the major constituent of precision casting investment mixes, improves dimensional constancy of molds, makes them stronger and more resistant to erosion by metal flow.

Investment costs are measurably reduced because an appreciably lesser amount of bonding agent is needed. This is attributable to the very desirable particle sizing and the equiaxed, dense grains of CALAMO.

CALAMO, used alone or as the major part of conventional dry sand molding mixes in rammed, or in slinger-place sand molds, provides not only the very desirable low thermal expansion particularly suited for precision casting but also the refractoriness for metals and alloys melted at unusually high temperatures.

H-W Flintgrain for ceramic shell molds

H-W FLINTGRAIN is an alumina-silica refractory, similar in composition to CALAMO, having the same very desirable low thermal expansion characteristics, but greater angularity of grain shape.

The angular grain shape and optimum size distribution make H-W FLINTGRAIN ideal for securing maximum compactness in the mold. It is used with special benefit for making ceramic shell molds and for similar applications in which dense, compact mold sections of greatest volume stability at all temperatures, are of paramount importance.

Illustration of angulate shape of H-W Flintgrain enlarged x3

H-W Mullite Grains and Flours for precision molding of metals at extremely high temperatures

These H-W Mullite products by virtue of their high-alumina composition and low content of basic oxides are very refractory. The hard dense grains are strong and most resistant to fluxing. Excellent thermal stability accounts for their unusual constancy of volume up to their temperature limit. Thermal expansion of these H-W Mullite products corresponds closely to that of CALAMO. These are the properties of H-W MULLITE GRAINS and FLOURS which commend them for precision casting work at very high temperatures.

HARBISON-WALKER REFRACTORIES CO.

AND SUBSIDIARIES

World's Most Complete Refractories Service **GENERAL OFFICES: PITTSBURGH 22, PA.**

Circle 562 on Page 53

Faster Load Lifting With New Coffing Quik-Lift Air Hoist

12 MODELS
lift full load 10 feet
500-pound hoist— 7 seconds
1000-pound hoist— 9 seconds
2000-pound hoist—24 seconds

Speed, accurate control, safety and long life are combined in the new Coffing Quik-Lift Air Hoist to give you efficient hoisting power.

Smooth power flow and absolute control at all speeds and loads is provided by the heavy-duty, 8-blade rotary air motor, the air-cooled disc brake and sensitive controls.

This hoist will not drop its load if air pressure fails for the brake is always engaged except when the motor is activated. If air supply fails, load can be safely lowered manually by the brake adjustment screw. The air-cooled, disc-type brake provides four times as much braking area as conventional brakes.

Free movement so that the push-button pendent control is always correctly positioned for easy use is provided by the swiveling features of the air supply hose and pendent hoses. Safety hooks, which are standard equipment on all models, swivel on roller thrust bearings.

The Coffing Quik-Lift Air Hoist is available in 500, 1000 and 2000-pound capacities —with either link or roller chain and with interchangeable manual pull-cord or push-button pendent controls. Ask your distributor or write for Bulletin ADH-79.

COFFING HOISTS

DUFF-NORTON COMPANY

COFFING HOIST DIVISION • Pittsburgh, Pa.

COFFING HOISTS
Ratchet Lever • Air
Hand Chain • Electric

DUFF-NORTON

DUFF-NORTON JACKS
Ratchet • Screw
Hydraulic • Worm Gear

on display at Philadelphia, and some of the winners in the contest gathered around for the photograph shown in the accompanying illustration.

Reading from left to right are Mr. and Mrs. William Phillips, who won a trip to Hawaii; W. E. Eccles, foundry superintendent, Cooper-Bessemer Corp., Grove City, Pa. (RCA television set winner); Pat Clooney, American Airline stewardess; R. K. Williamson, plant engineer, Erie Malleable Iron Co., Erie, Pa., (RCA television set); Mr. and Mrs. Joseph Tavernier, Jo-Foundry, Elkhart, Ind., (all-expense trip to foundry show).

The search for Handlebar Harry probably was one of the most thoroughly promoted contests ever conducted in the foundry and allied industries.

Our congratulations to the winners.

—o—

Nice Casting: Among interesting castings shown at the Pettinos booth was an excellent example of a cast fire plug made by the A. P. Smith Mfg. Co., East Orange, N. J. Even before the convention opened, my

son, who is assistant plant superintendent of the Smith company, suggested it would be nice if this column used a photo of that casting.

As the pressure for such action mounted, I gave in, and our photographer and editor visited the booth to get a photograph of the casting and the dogs, which every well adjusted fire plug must have.

Plans sometimes go awry. Someone thought it would be a good idea to have several of the ladies in the picture, and, to make a long story short, when we got the print we had lots of nice ladies and very little of the casting.

Well, John, we tried.

F.G.S.

another **FIRST** *from*

WHEELABRATOR®

COMBINED
CORE KNOCK-OUT
AND
BLAST CLEANING

as introduced at the 1960 Foundry Show

Circle 564 on Page 53

NEW WHEELABRATOR®
CORE KNOCK-OUT AND BLAST CLEANING MACHINE

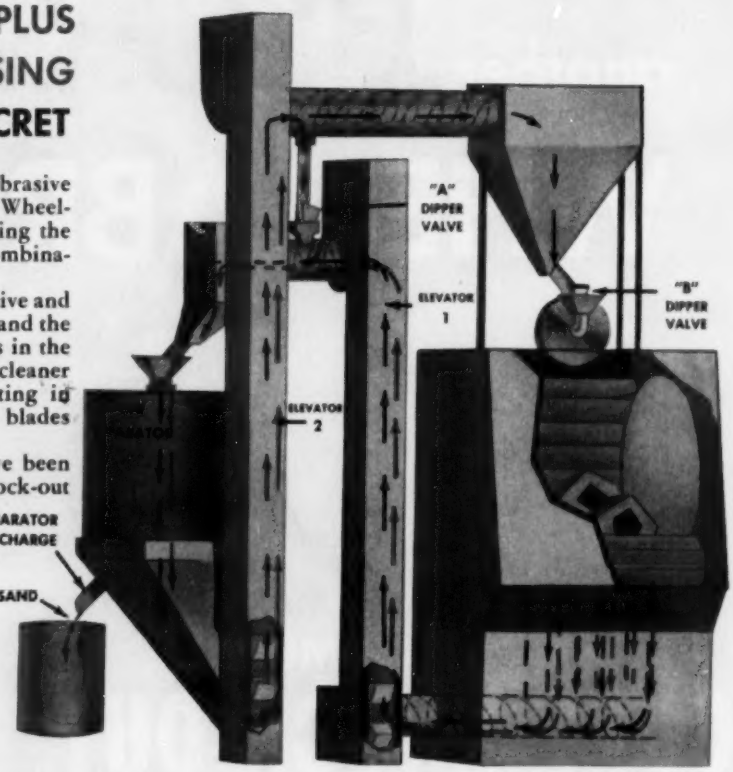
SUPERIOR SEPARATION PLUS AUTOMATIC BY-PASSING IS THE SECRET

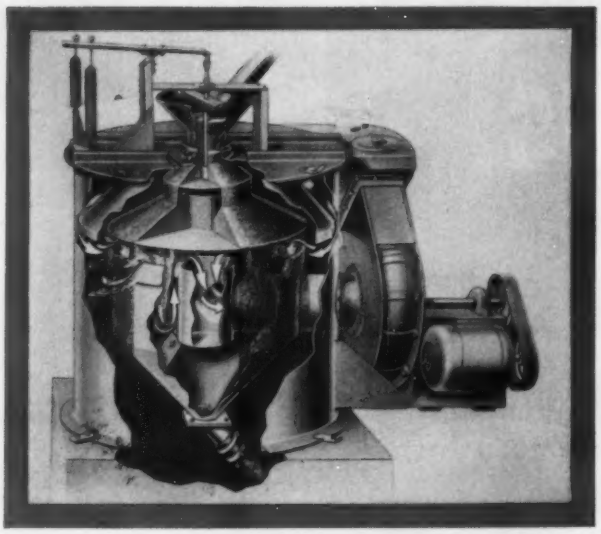
A radically new double elevator system of abrasive cycling combined with the ultra-efficient new Wheelabrator CFR Separator, now permits handling the extremely heavy sand loads required for combination core knock-out and blast cleaning.

During the core knock-out cycle, the abrasive and sand recirculate through the by-pass system and the CFR Separator, as shown by the red arrows in the diagram at right. The castings are generally cleaner than after a conventional shake-out, resulting in shorter cleaning cycles and longer life of blades and wear parts.

When all the sand and contaminants have been removed from the abrasive, and the core knock-out cycle is completed, the cleaning blast takes place in the same machine, without rehandling the castings.

For the cleaning blast, the dipper valve at "A" closes, and the abrasive circulates in a complete cycle through the wheel, as shown by the black arrows.





THIS REMARKABLE NEW SEPARATOR MAKES DUAL-PURPOSE BLASTING POSSIBLE

The new Wheelabrator CFR Separator is the most efficient separator ever developed for airless blasting. Its high efficiency is due to the perfectly uniform spread of mixture over the entire circumference of a *fixed* lip. Because of the unequalled efficiency of the CFR Separator, it is now economically possible to combine core knock-out and blast cleaning in a single machine. Let us tell you about these and other features of this remarkable separator.

COMBINATION

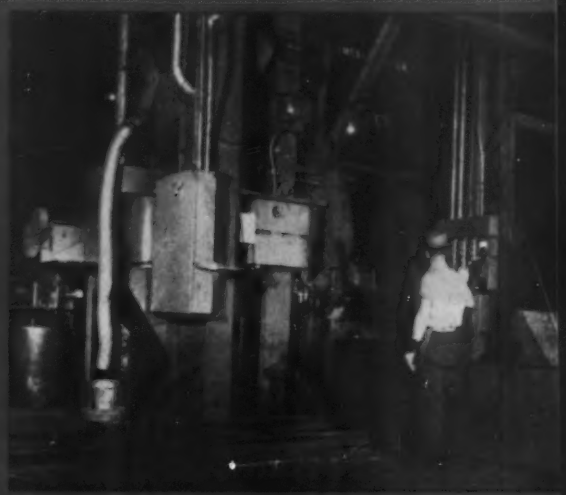
This revolutionary new two-in-one machine delivers a "one-two" knock-out punch to foundry operating costs, by combining core knock-out and blast cleaning operations in one machine, without rehandling. It does *both* jobs in less time than is often required for either core knock-out or blast cleaning, where these operations are performed separately.

- **Save time**—perform both processes without intermediate handling of castings.
- **Save labor costs**—eliminate shake-out or manually knocking out cores on many types of castings. Both operations done with no more labor than you now require for blast cleaning alone.
- **Save on equipment**—eliminate or reduce cost of shake-out equipment, parts, and maintenance.
- **Save space**—free the "shake-out" area for other use.
- **Save on maintenance** — this dual-purpose Wheelabrator costs less to operate than many old blast cleaning machines.

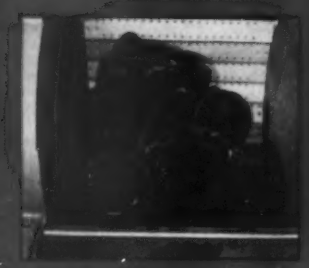
NEW COST-CUTTING EFFICIENCY

The efficiency and economy of dual-purpose blast cleaning in Wheelabrator equipment has been proven at T. McAvity & Sons, Ltd., St. Johns, N.B., Canada. Using a 22 cubic foot Super Tumblast with the CFR Separator and double elevator abrasive cycling system, this gray iron foundry is getting results like these on castings weighing up to 1100 lbs. each:

- Combined labor savings of 150 man-hours a week.
- 50% reduction in direct labor previously required for manual core knock-out and operation of an old Tumblast.
- 87% reduction in direct labor for their airblast room, since most of their production goes through the Super Tumblast.
- Blade life over 100 wheel hours per set while handling these tremendous sand loads, as shown . . . a direct result of CFR Separator efficiency.
- Consumption of Wheelabrator Steel Shot only 12.4 lbs. per wheel hour.

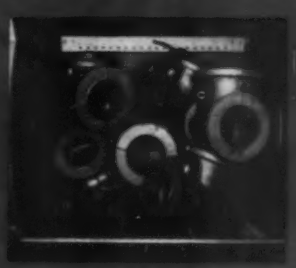


STAGES IN COMBINATION CORE KNOCK-OUT AND BLAST CLEANING OPERATION



Six 5" Valve Bodies, weighing 175 pounds each, as loaded into Super Tumblast.

After Core Knock-Out Cycle.



After Complete Blast Cleaning Cycle.

WHEELABRATOR DUAL-PURPOSE BLAST CLEANING IS PERFORMANCE-PROVEN, ACCEPTED BY PROMINENT FOUNDRIES

Combination core knock-out and blast cleaning Wheelabrator equipment is also in use or on order for these leading foundries: Jenkins Bros.; Brown & Sharpe Mfg. Co.; Singer Mfg. Co.; Plainville Castings Co. No other new development for foundry operation has achieved such wide acceptance so quickly in recent years. In addition to the Tumblast batch-type mill, a variety of Wheelabrator equipment for combination core knock-out and blast cleaning is available.

For complete information on what this new type of blast equipment can do for you, call your Wheelabrator representative, or write to WHEELABRATOR CORP., 505 S. Byrkit St., Mishawaka, Ind. In Canada, P.O. Box 490, Scarborough, Ontario.

WHEELABRATOR
CORPORATION

Circle 565 on Page 53

WHY PAY MORE

when you can buy the best binder at the lowest price!

INSIST ON STEINEX

the original CO_2 Binder available only from Carver

BEST QUALITY Steinex gives you absolutely the best shakeout —BY FAR!

BEST PRICE Steinex is 30% lower in cost than any other binder on the market!

BEST SERVICE Carver has the in-the-foundry experience and know-how to help you use Steinex in your CO_2 operation — successfully and profitably!

JOIN THE HUNDREDS OF FOUNDRIES THAT INSIST ON THE BEST

MAIL TODAY

CARVER FOUNDRY PRODUCTS CO. F-26
Muscatine, Iowa

RUSH **information and prices on Steinex binders.**

NAME _____ TITLE _____

FOUNDRY _____

CITY _____ STATE _____

CALENDAR of Meetings

July 4-6—European Investment Casters Conference, Liege, Belgium.

Sept. 6-10—The Machine Tool Exposition—1960, International Amphitheatre, Chicago.

Sept. 6-16 — Production Engineering Show, Navy Pier, Chicago.

Sept. 18-20—Steel Founders' Society, fall meeting, Homestead, Hot Springs, Va.

Sept. 19-24—International Foundry Congress, Zurich, Switzerland.

Sept. 22-23—National Foundry Association, annual meeting, Edgewater Beach Hotel, Chicago.

Sept. 26-28—Standards Engineers Society, annual meeting, Hilton Hotel, Pittsburgh.

Oct. 12—Cast Bronze Bearing Institute, annual meeting, Grove Park Inn, Asheville, N. C.

Oct. 13-14—Gray Iron Founders' Society, annual meeting, Netherland Hilton Hotel, Cincinnati.

Oct. 13-15—Non-Ferrous Founders' Society, annual meeting, Grove Park Inn, Asheville, N. C.

Oct. 17-19—American Coke and Coal Chemicals Institute, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 17-18—Magnesium Association, annual convention, Hotel Carter, Cleveland.

Oct. 17-21—American Society for Metals, National Metal Exposition & Congress, Trade and Convention Center, Philadelphia.

Oct. 17-21—National Safety Council, Annual Safety Congress, Chicago.

Oct. 20-22—Foundry Equipment Manufacturers Association, annual meeting, Greenbrier Hotel, White Sulphur Springs, W. Va.

Oct. 19-21—Society for Experimental Stress Analysis, annual meeting, Hotel Claremont, Berkeley, Calif.

Oct. 22-25—Conveyor Equipment Manufacturers Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 27-28—Michigan Regional Foundry Conference, Bancroft Hotel, Saginaw, Mich.

Nov. 1-3—Material Handling Institute Inc., Central States Show, Kentucky Fair and Exposition Center, Louisville.

Nov. 8-11—Society of Die Casting Engineers, First National Die Casting Exposition & Congress, Detroit Artillery Armory, Detroit.

Nov. 14-16—Steel Founders' Society, Technical and Operating Conference, Pick Carter Hotel, Cleveland.

Nov. 30 - Dec. 2 — Metallurgical Society of AIME, Electric Steel Conference, Morrison Hotel, Chicago.

1961

March 11-14—Steel Founders' Society of America, annual meeting, Drake Hotel, Chicago.

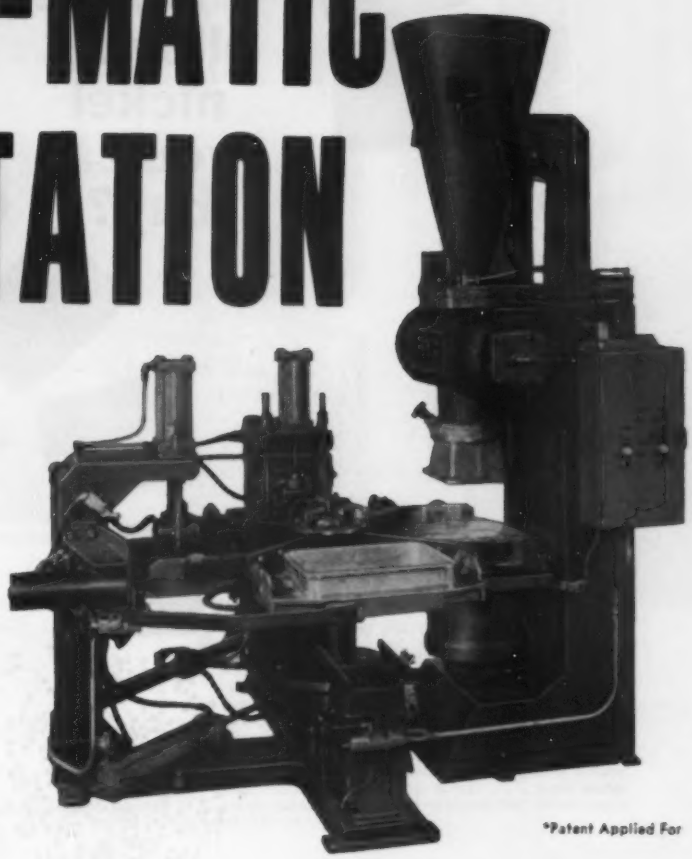
March 20-24—American Society for Metals, Western Metal Show, Pan-Pacific Auditorium, Los Angeles.

April 18-20—Foundry Educational Foundation, annual college-industry conference, Hotel Statler, Cleveland.

May 8-12—American Foundrymen's Society, Castings Congress & Exposition, San Francisco.

Another CARVER "COMPATIBLE CO_2" First!

THE NEW CARVER CARV-O-MATIC* MOLD STATION



*Patent Applied For

50% more Production with this new, fully-automatic, one-man mold station!

Now—"Push Button" Core-making that Saves TIME (50% more molds per hour); LABOR (one-man operation); SPACE (less than 57 sq. ft.); and MONEY (far less rejects — thanks to completely automatic handling).

The new CARVER "CARV-O-MATIC" Mold Station is a revelation in core and mold-making-efficiency.

Based upon a continuous rotation principle, each complete cycle automatically shoots, gasses, and ejects four flasks — delivering the molds or cores directly to the conveyor.

The operator is not required to move a single step from his position at the control panel to achieve continuous sand-to-finished core production.

With complete automation, the incident of human error has been virtually eliminated and rejects can be attributed only to faulty mixtures or improperly made or vented flasks. Mail coupon for complete details.

Carver FOUNDRY PRODUCTS CO.
MUSCATINE, IOWA
Everything for the CO_2 Process

F-5

CARVER FOUNDRY PRODUCTS CO.
Muscatine, Iowa
Please send complete information on new CARV-O-MATIC MOLD STATION.

FOUNDRY _____

ADDRESS _____

CITY _____ STATE _____

NAME _____

Circle 567 on Page 53

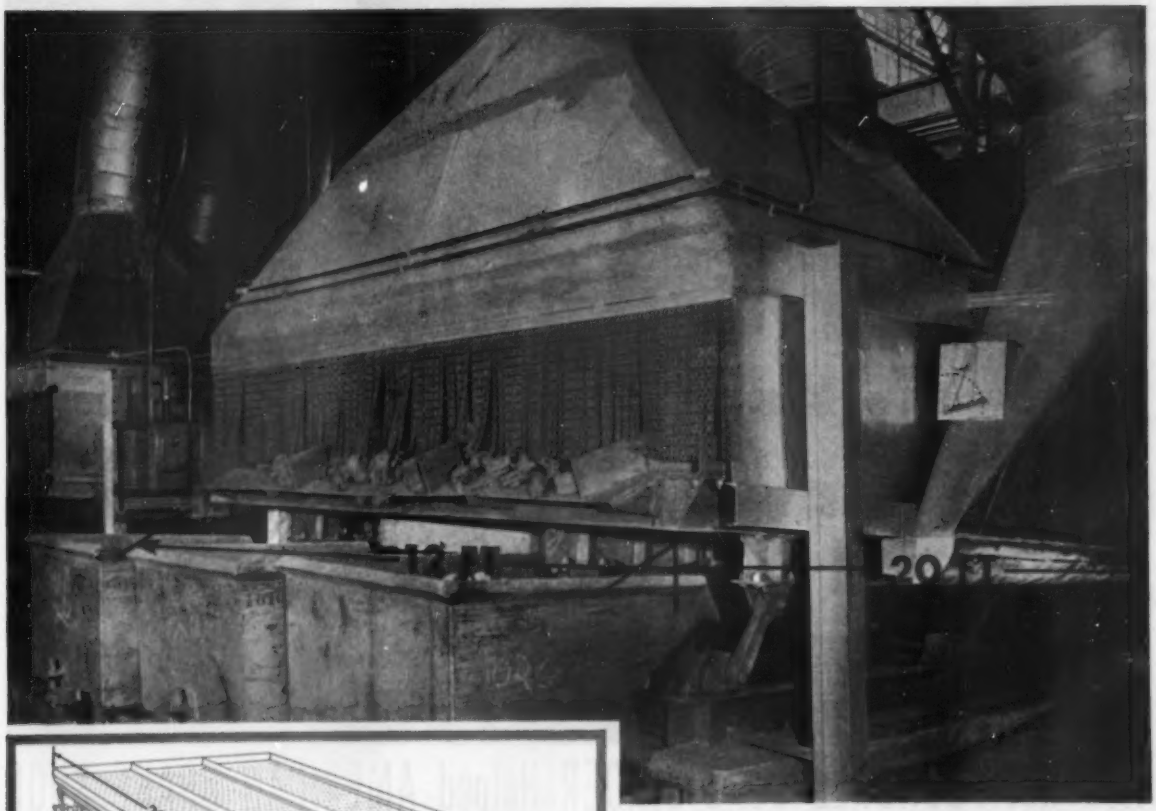
By the drumful, shovelful, scoopful, handful, or spoonful . . . Sherritt nickel is about the most convenient alloying metal you can buy. No wrestling with unwieldy plates. No cutting or hacking. High-purity Sherritt nickel comes to you in handy briquettes and in three grades of powder for faster, easier alloying. These powders and briquettes go into solution more rapidly with less chilling. You can make alloying additions at the end of the heat. Special nickel grades and coated powders are also available.

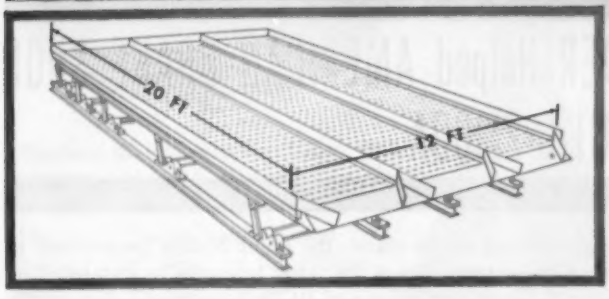
FOOTE MINERAL COMPANY *is the exclusive sales agent for Sherritt nickel and cobalt in the United States and Canada. For complete illustrated brochure with prices and delivery information, contact the Foote Mineral Company, 4738 Eighteen West Chelten Building, Philadelphia 44, Pa.*

SHERRITT GORDON MINES LIMITED

12-ft. wide oscillating conveyors

take castings through air quenching in 3600-lb. batches





POSITIVE ACTION! NATURAL FREQUENCY! Like all Link-Belt oscillating conveyors (Coilmounts for medium duty, Flexmounts for light duty), the mammoth, heavy-duty Torqmounts at this installation operate with a combination of natural frequency and positive action. Natural frequency results in low operating requirements and minimum stress on parts under load. Positive action of the unit's eccentric drive provides a constant, uniform conveying action . . . even under surge loads which often dampen-out other types of vibratory conveyors.

Huge LINK-BELT Torqmount conveyors assure uniform cooling at large midwest automotive foundry

Normal widths of Link-Belt oscillating conveyors range up to 48 inches. But to meet the needs of this air quenching job, Link-Belt custom-designed three 12-ft. wide giants.

As the red hot castings ride to the air chamber, oscillating action spreads the batch evenly over the perforated plate Torqmount bed . . . voids are minimized. Result: maximum exposure to air, uniform quenching.

For the best in light, medium or heavy-duty conveying, call your nearest Link-Belt office or authorized stock-carrying distributor. Or write for Book 2744. It contains complete data on all three types of Link-Belt oscillating conveyors: Torqmount, Coilmount, Flexmount. 15,300

LINK-BELT

OSCILLATING CONVEYORS

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Warehouses and District Sales Offices in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World.

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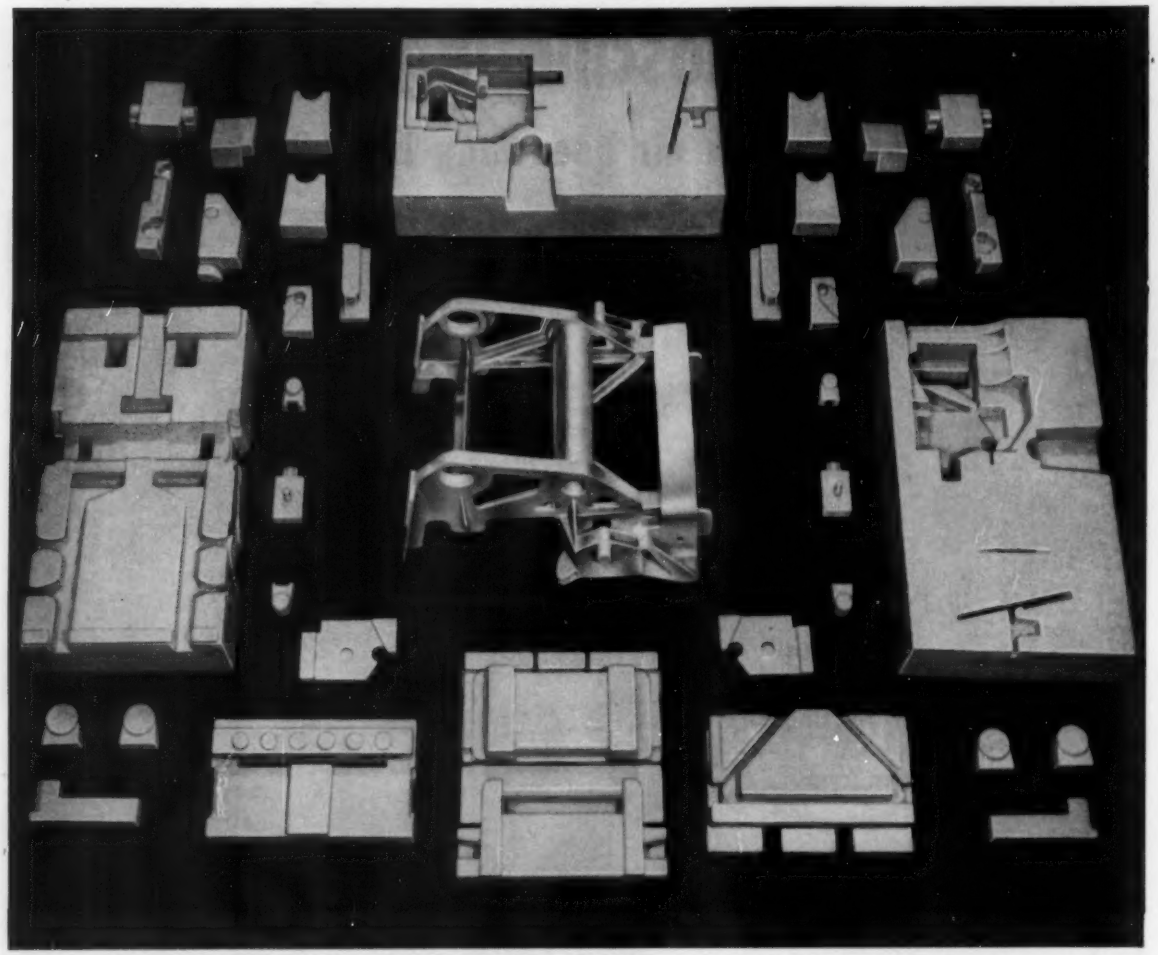


How RCI FOUNDREZ CORE BINDER Helped AMERICAN BRAKE SHOE Meet MIL-C-21180A

To produce the strong, dimensionally precise, lightweight casting shown above, the Light Metals Department of American Brake Shoe Company in Mahwah, New Jersey called upon two of the latest advances in metalworking technology... Ductaluminum, a relatively new and stronger aluminum alloy and RCI's FOUNDREZ liquid amino-aldehyde core binder. Used together, they now make it possible for foundries to meet military specifications in castings of this complex nature. ■ Thirty-six individual cores (see illustration) are required to produce this jet canopy casting. And why does American Brake Shoe choose RCI FOUNDREZ for this application? Four factors are involved: **1.** *RCI's liquid amino-aldehyde core binder provides better binder distribution in the core sand which contributes to exact casting dimensions and keeps surface defects at a minimum.* **2.** *The advantage of dielectric baking, and the high core strength obtained, increases core production and speeds core handling.* **3.** *Excellent core knockout and collapse qualities, at the lower pouring temperatures of aluminum, speed production and reduce the cost of finishing.* **4.** *RCI's reputation for on-time delivery and prompt technical service.* ■ If you are pouring metal castings at temperatures below 2700° F, we suggest you investigate the improved core properties offered by RCI's FOUNDREZ liquid amino-aldehyde binder. Reichhold will deliver this unique resin to you from seven convenient shipping points in tank cars, tank trucks or drums. Write today for Technical Bulletin F-2-R for full data on RCI's FOUNDREZ 7600 series.

Creative Chemistry... Your Partner in Progress

RCI

REICHHOLD
FOUNDRY PRODUCTS
REICHHOLD CHEMICALS, INC., RCI BUILDING, WHITE PLAINS, N.Y.

FOUNDREZ *Synthetic Resin Binders*
COROVIT *Self-curing Binders*
CORCIMENT *Core Oils*
CO-RELEES *Sand Conditioning Agent*
REICOTE *Sand Processing Agent*

YOU'LL DO A BETTER JOB

with H. V. ADAMS DESIGNED

HIGH EFFICIENCY FOUNDRY TOOLS

"UNIVERSAL FREE WHEELING"

FOUNDRY SAND RIDDLE

with the Double Eight Vibration

Because of its convenient size, light weight and good riddling capacity it long has been a favorite in the foundry. It also can be used for mixing core sand or for sifting sand directly into molds.

The mechanism is entirely enclosed protecting it from harmful dust and grit.

The main frame is cast in very strong tough aluminum.

It uses quick change ferruled sieves with 20 in. diameter sifting area. There are no loose wires to harm hands.

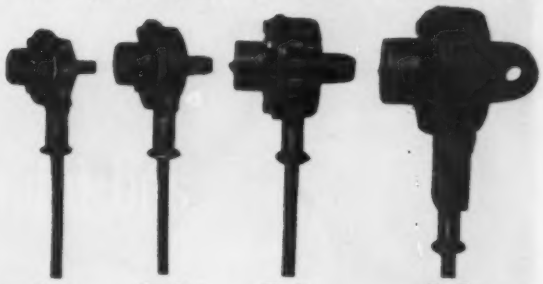
THE "ROTOPLANE" SPEED SIFTER

WILL GIVE YOU

• SPEED • ECONOMY • SAFETY • LONGER LIFE
• GREATER SIFTING CAPACITY

Its sturdy one-piece frame and long shaft add to vibration effectiveness. The sealed-in mechanism assures protection of motor and bearings from exposure to dust and grit. This sealed in protection and "Rotoplane's" free-rotary action vastly increase bearing life. No exposed moving parts endanger the operator. Sieves have 20 inches diameter clear sifting area—are mounted in a smooth steel ferrule with no jagged edges to cause dangerous cuts and scratches.

"RED (Devil) ELECTRIC" VIBRATORS



No 1 No. 2 No. 3 No. 9

These hard hitting Adams designed Vibrators have served the foundries for over 30 years. They are provided with a 6 foot 3 wire authorized cable and 3 wire grounded connector which, when connected with our 3 wire grounded Red Electric Knee Switch, automatically grounds the vibrator protecting the worker from shock. The vibrators have passed the U. S. Government code inspection.

Other Foundry Products:

- No. 11 NOISELESS TYPE VIBRATOR
- A-20 ELECTRIC VIBRATOR
- RED ELECTRIC KNEE SWITCHES
- "ROTO" ADJUSTABLE BIN VIBRATOR
- 2 MIN. UNIVERSAL FINENESS TEST SIFTER.
- UNIVERSAL TRIPOD CARRIER

ORDER ALL SIFTERS AND VIBRATORS WITH GROUND WIRE!!

FOUNDRY SUPPLIES MANUFACTURING CO., NOT INC.

2221 Orchard Street - Chicago 14, Illinois

Established 1918 Cable Address: "Rotoplane Chicago" H. V. ADAMS, Mgr.

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we like to be close to our customers

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and future customers!

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GArfield 6-6520

Houston
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Atlanta
TRinity 5-8196
and
CEdar 3-2361

Nashville
CYpress 2-7016

Trenton
OWen 5-6205

Whether you want information on an application, or service on an existing installation, the Ajax Magnethermic man can give you assistance. He knows induction heating and melting.

induction heating is our only business!

Ajax Magnethermic CORPORATION

GENERAL OFFICES..... P. O. BOX 839
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TRENTON DIVISION..... 930 Lower Ferry Road
Trenton 5, New Jersey

YOUNGSTOWN DIVISION... 3990 Simon Road
Youngstown 1, Ohio

Circle 572 on Page 53

These twin 1000-lb. melting furnaces prepare copper for metal powder at the St. John's, Michigan, plant of Federal-Mogul-Bower Bearings, Inc.

WATCH AM

FOR THE NEW IDEAS IN HEATING AND MELTING BY INDUCTION

Copper Melting Furnaces, one of many products of AM, for the heating or melting of metals by Induction.

"induction heating is our only business"

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Trenton 5, New Jersey

YOUNGSTOWN DIVISION
3990 Simon Road
Youngstown 1, Ohio

Circle 573 on Page 53

Protects Against

- Molten Splash
- Acids
- Steam
- Water
- Oil
- High Heat

Walk Right Up To 3000°F Splash with

AO THERMOGARB

Foot and Leg Protection

This Thermogarb Spat Protects, Instep, Ankle, Foot. Easily adjusted at top and under instep by snap fasteners. Immediate release in one swift motion. Chrome leather flare over instep. W4903 white, Y4903 yellow.

Spring Type Legging Requiring No Adjustment. Easily put on and removed. Spring steel frame protects leg from impact and provides air space between leg and legging for insulation. Chrome tanned leather flare with spring clip.

W1481 white, Y1481 yellow.

Always insist on ® *Trademarked Safety Products*

Your workers may never be exposed to the 3000° molten splash that AO Thermogarb can take without harm. But it's good to know they can walk into such hot situations and be protected.

Material is far lighter than you'd expect (weighs appreciably less than conventional asbestos) . . . has 40%-50% superior abrasion resistance and almost double the tensile strength. Result: Longer wear life, lower costs. Write for new brochure on the **complete* Thermogarb line to AMERICAN OPTICAL COMPANY, SAFETY PRODUCTS DIVISION, SOUTHBRIDGE, MASS.

*Includes coats, cape sleeves, coveralls, sleevelets, pants, chaps and aprons.
Safety Service Centers in Principal Cities.

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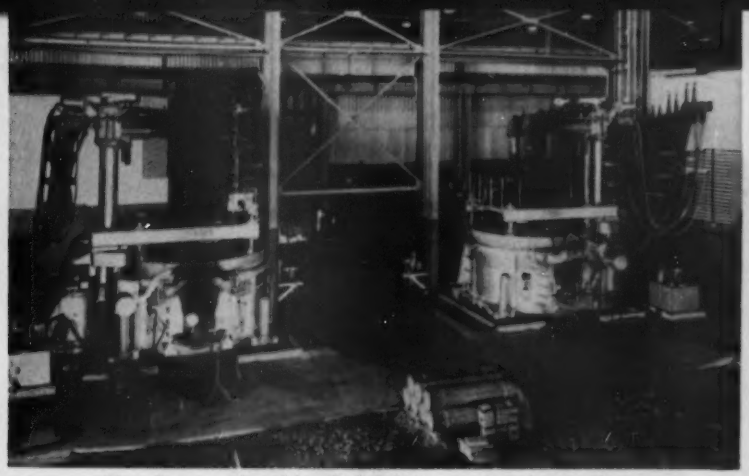
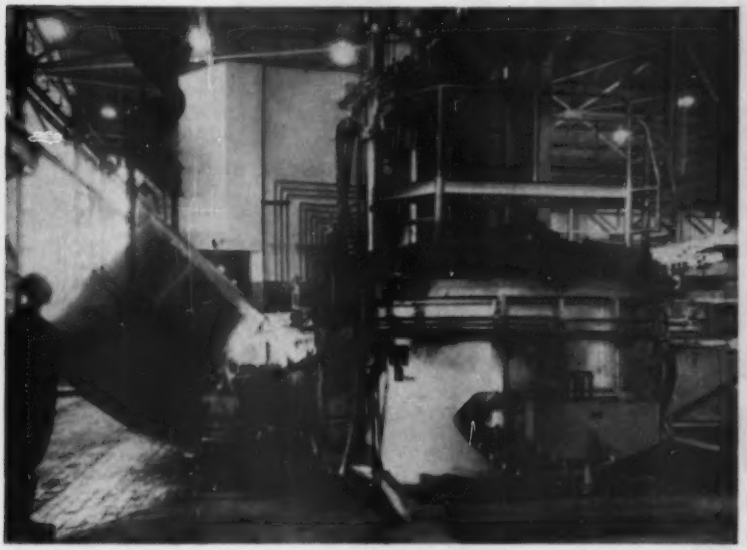
Your Surest Protection . . . AO SURE-GUARD Products

Circle 574 on Page 53

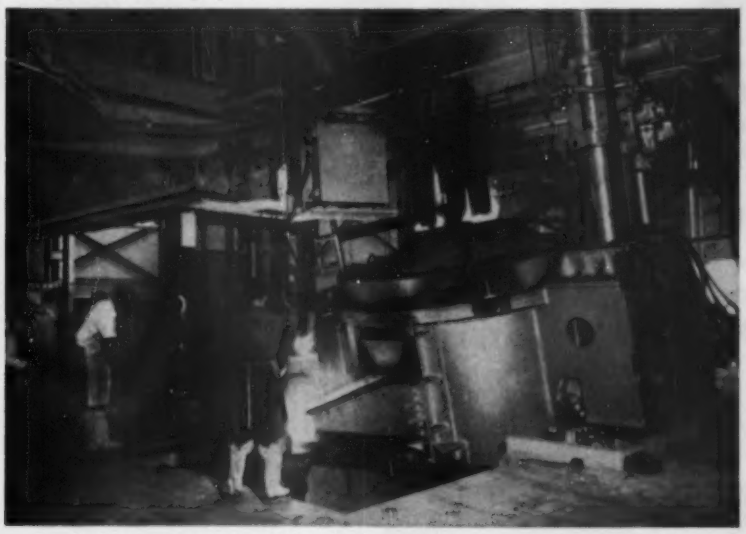
Circle 575 on Page 53→



Two Lectromelt cold-melt batch furnaces melt gray iron.



Molten metal is transferred to Lectromelt duplexing furnace through special duck-bill receiving spout.



Duplexing furnace is tapped into ladles which are conveyed to pouring floor.

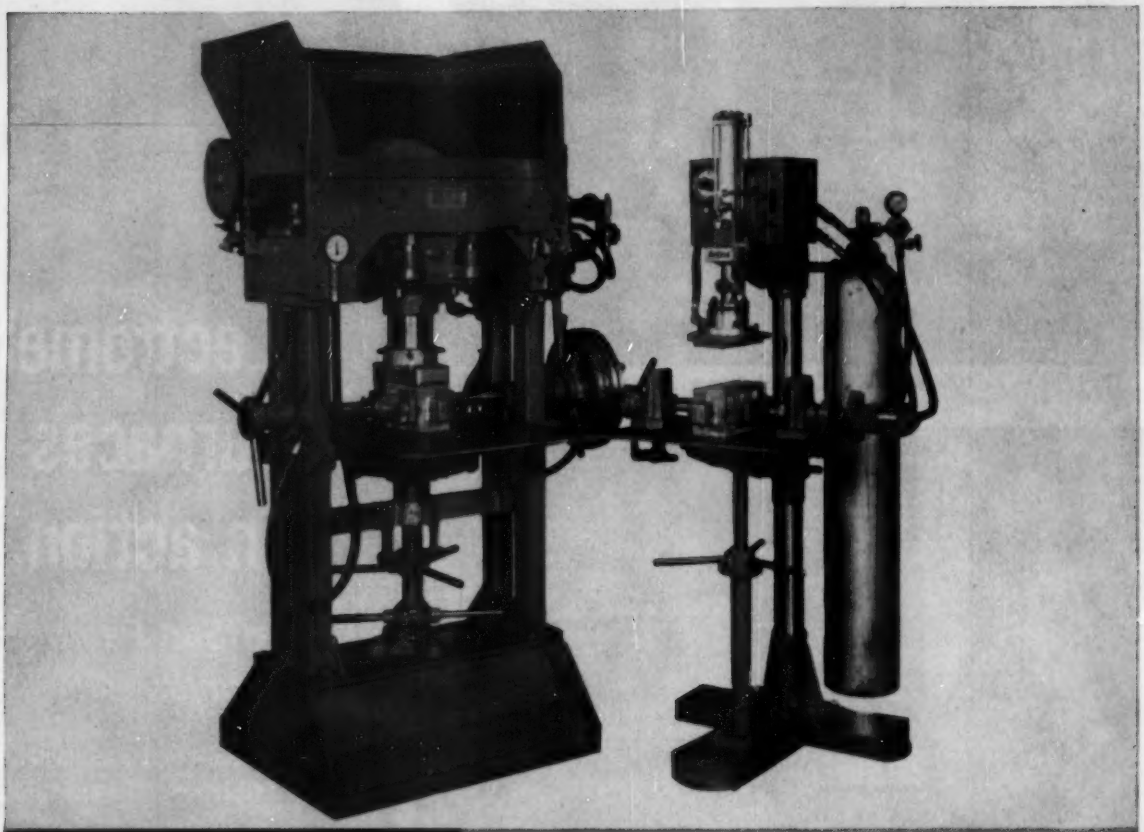
Lectromelt furnaces in action

at Sao Paulo foundry

Efficiency keynotes the layout of Lectromelt furnaces at this South American gray iron foundry. The two Lectromelt 5000-KVA cold-melt furnaces have fast charging, raise-and-swing roofs and superstructures. Each melts and taps in excess of 9 tons of iron in 1½ hours. The duplexing furnace, designed for fast handling of molten metal, superheats and adjusts the analysis of more than 20 tons of iron per hour.

For productivity in your melting, contact Lectromelt Furnace Division, McGraw-Edison Company, 314 32nd Street, Pittsburgh 30, Pa.

WHEN YOU MELT... Lectromelt® McGRAW-EDISON



Redford

NO. 4 CORE BLOWER with MODEL H-1-E CO_2 CORE HARDENING STATION

The right tools to get maximum performance with a minimum of effort if you make cores by the CO_2 Process.

One core box is being blown while another one is automatically clamped, the cores hardened in the core box and the core box released ready to remove finished cores.

The table height of the Model H-1-E Core Hardening Station can be adjusted to correspond with the height of the core blower table. Gassing time is quickly changed to meet job requirements.

Whether you blow cores with conventional sand mixtures or use the new CO_2 Process, REDFORD EQUIPMENT gives you the best in over-all performance.

Redford IRON & EQUIPMENT CO.
20733 Glendale • Detroit 23, Michigan
Phone: KEnwood 1-8611

write for
BULLETINS 4 and H

METALGRAMS

UNION CARBIDE METALS

". . . news about "Electromet" ferroalloys and metals

JULY 1960

BETTER MACHINABILITY -- Polls of gray iron castings users have indicated that they rate good machinability as "extremely important." Foundry men are improving the machinability of their castings by inoculating iron in the ladle with "SMZ" alloy. This strong graphitizing inoculant eliminates chilled corners and edges that cause excessive tool wear and breakage in the machine shop. As much as 25 per cent faster machining rates have been reported. Only 2 to 4 lbs. of "SMZ" alloy per ton generally eliminates chill. Further facts can be obtained by writing for a 16-page booklet, F-4604C.

* * *

PROMOTES UNIFORMITY -- Many foundries use small amounts of chromium to improve the uniformity of gray iron castings having light and heavy sections. Up to one per cent chromium will stabilize a pearlitic structure, eliminating soft spots caused by slow cooling in heavy sections. When properly balanced with silicon, low-chromium irons can be kept free of chilled spots caused by rapid cooling in thin sections. Union Carbide Metals offers several chromium alloys for such additions, including high-silicon grades to neutralize the chilling effect of chromium. Your Union Carbide Metals representative will be glad to give you further details.

* * *

BETTER HANDLING AND STORAGE -- Improved packaging techniques allow more efficient handling and storage of ferroalloys in the foundry. Heavy-gauge steel drums assure safe storage and protection of alloys against contamination, rough handling, and mechanical loss. Wooden pallet boxes provide a practical and low-cost means of transporting and storing large quantities of material. So do flat pallets with corrugated wrappers that are used to ship some types of "EM" briquets. These pallets are easily handled by fork lift or overhead crane.

* * *

AT YOUR SERVICE -- Improved alloys and packaging techniques are under constant study at Union Carbide Metals. Experienced materials-handling representatives work directly with metal producers to help determine the most efficient and economical types of alloy packaging and handling in individual plants. Their recommendations on traffic, handling, storage, and usage often result in big savings in money, time, space, or material.

* * *

NATION-WIDE FACILITIES -- To meet the demand for a wide variety of alloys and metals, Union Carbide Metals maintains an efficient warehouse and distribution network to serve metal producers throughout the country. Stocks are maintained at 6 plants and 26 warehouses conveniently located near major metal-producing centers. Rail, truck, barge, and boat shipments speed products to customers' plants. Your Union Carbide Metals representative will be glad to give you further information about the products and services described above. Ask for the article, "Electromet Alloys...When, Where, How You Need Them," in the Winter 1959 issue of UNION CARBIDE METALS REVIEW.

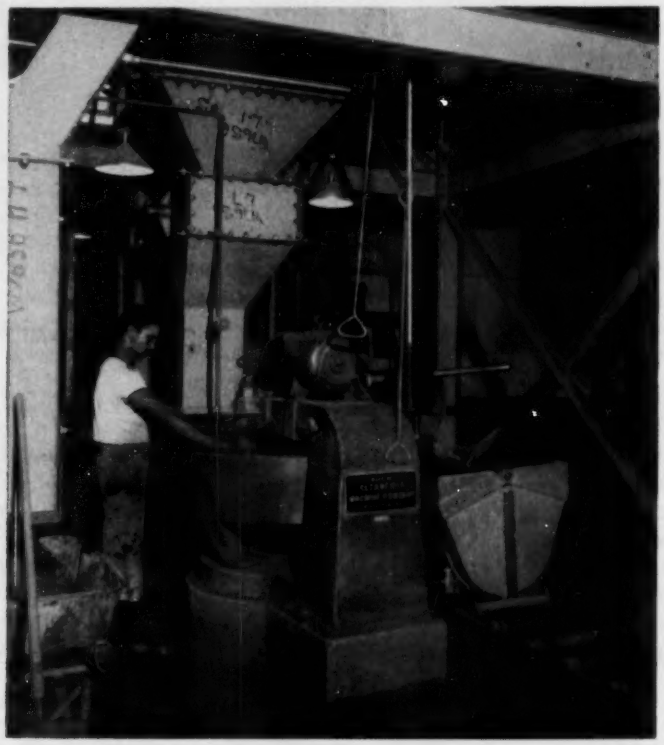
* * *

UNION CARBIDE METALS COMPANY, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. In Canada: Union Carbide Canada Limited, Toronto.

"Electromet," "EM," "SMZ," and "Union Carbide" are registered trade marks of Union Carbide Corporation.

Circle 577 on Page 53

"Il successo e la straordinaria diffusione delle molazze 'Clearfield' in Italia e nei Paesi di esportazione, confermano l'indiscussa superiorità di queste macchine."



More proof that Clearfield Mixers are popular everywhere!

ITALIAN LICENSEE SELLS 80 CLEARFIELD MIXERS IN JUST 3 YEARS

The wide use and acceptance of the Clearfield Mixer is demonstrated by the success story of one of Clearfield's licensees—Officine Meccaniche Pramaggiore, of Italy. During the past three years this one company sold 80 Clearfield mixers to foundries in locations ranging from Yugoslavia to Argentina.

Among the reasons for the popularity of Clearfield mixers, according to the Italian company, are (1) the great *adaptability* of the mixers—to any plant, and for a variety of uses (2) their high *efficiency* . . . of power consumption as well as production output, and (3) their high safety factor.

Other users praise Clearfield Mixers for their speed, thoroughness, economy, service-free performance. Whether *your* need is for a mixer that affords a better balance of mixing, blending and tempering . . . maximum output with minimum use of power . . . economy from the standpoint of durability and ease of maintenance and operation . . . or a size that will fit your particular installation . . . you will find the machine to meet your requirements *exactly* at Clearfield.

Why not send for our free literature and get the complete story?

CLEARFIELD
MACHINE COMPANY
CLEARFIELD, PENNSYLVANIA, U.S.A.

Circle 578 on Page 53

12 B&W IFB lined single stack annealing covers in use in the strip annealing department of Weirton Steel Company, a division of National Steel Corporation, at Weirton, West Virginia.

uses lightweight B&W Insulating Firebrick for single stack annealing covers.

These 12 covers, lined with B&W K-20 Insulating Firebrick, have been in service more than two years in the annealing of low and high carbon strip from Weirton's 54" strip mill. Identical in construction, the covers are over 17 feet from base to skew and over 10 feet in diameter. The domes are of 9" K-20 IFB construction.

The K-20 is one of B&W's *lightweight* Insulating Firebrick. In fact, B&W K-20 IFB are at least a third of a pound lighter than other 2000 F insulating firebrick. This means savings in the overall weight of portable covers. Additional savings in fuel consumption and cycle time are possible because lightweight B&W IFB store and conduct less heat. Heat is kept in the furnace, not in the lining.

This application points out advantages of light weight in insulating firebrick constructions. And B&W makes the *lightest* weight insulating firebrick. Consult your B&W Refractories Representative for information on how you can profit with lightweight B&W IFB.

Bulletin R-2-H available on request.

Circle 579 on Page 53

B&W THE BABCOCK & WILCOX COMPANY

REFRACTORIES DIVISION

B&W Firebrick, Insulating Firebrick, and Refractory Castables, Plastics, Ramming Mixes, Mortars, and Ceramic Fiber.

3041-HP

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

HERMAN PNEUMATIC MACHINE CO.
UNION BANK BUILDING, PITTSBURGH 22, PA.

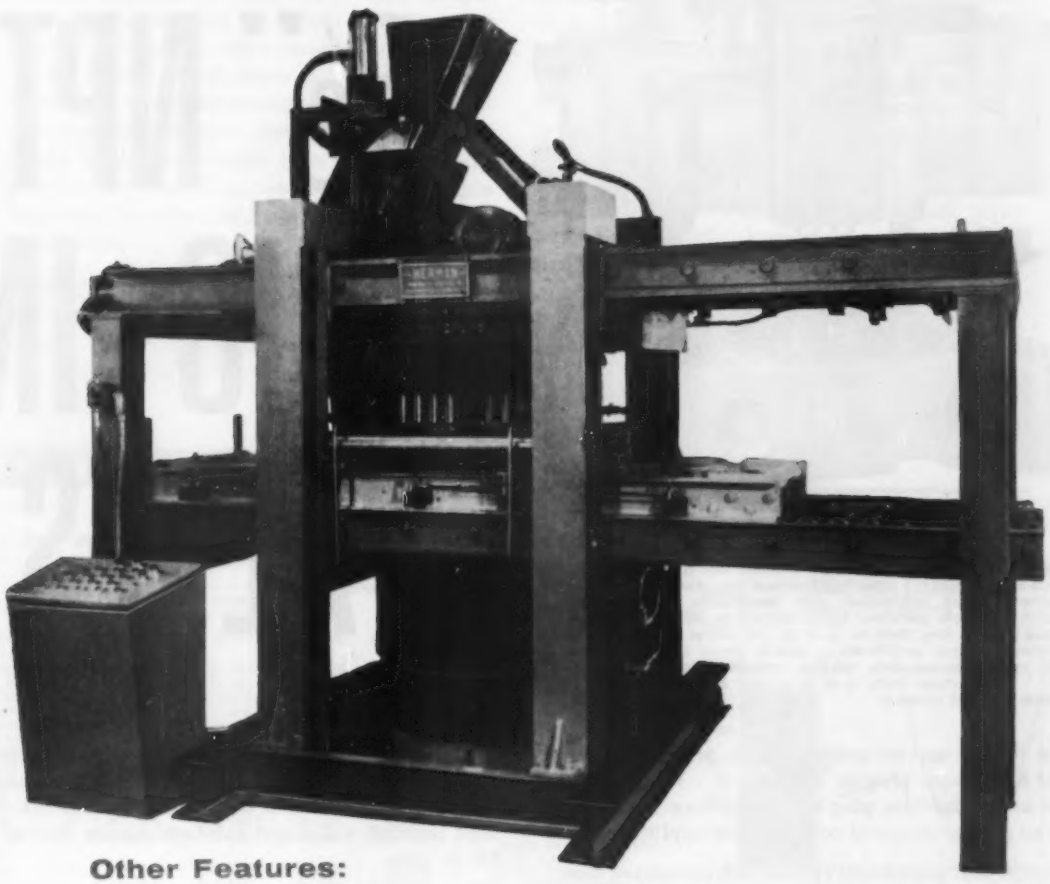
Here is the latest example of Herman quality engineering . . . the Straight-Through Moldmaster you probably saw in Philadelphia, at the A.F.S. Show.

It includes all of the progressive features of the established Herman Moldmaster, except that it's designed for the producer of small molds.

The Straight-Through Machine offers you self-contouring squeeze molding for flasks up to 500 sq. in. in area.

It's an economical, high speed, automatic machine.

Simultaneous cope and drag molding is provided.



Other Features:

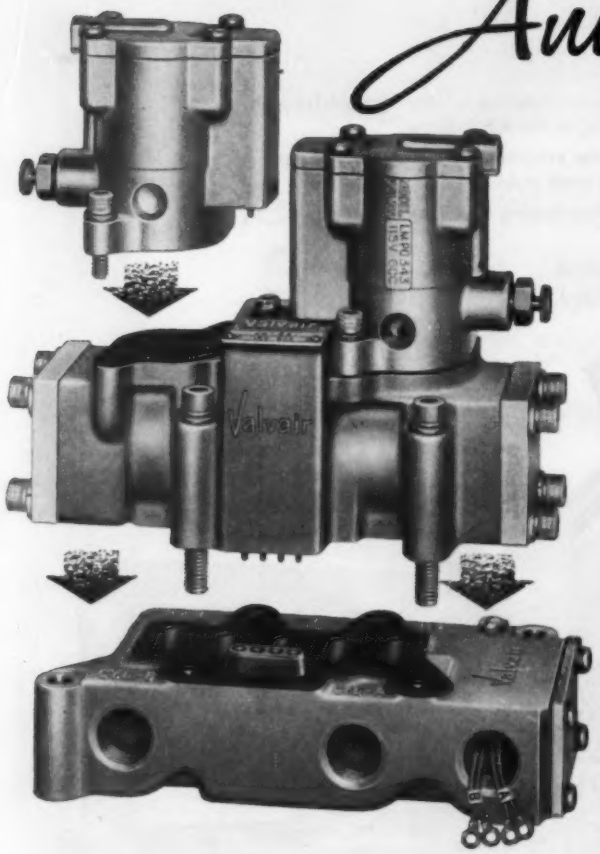
1. Fast, accurate pattern draw-down.
2. Pneumatically-controlled pressure squeeze against hydraulic squeeze feet.
3. Automatic, uniform flask filling into an upset, to minimize spillage.
4. Sand fill takes place during flask charging and the machine strikes off a finished mold automatically.
5. Quick pattern change.

These and other operating features of this particular Herman machine combine to make it a basic machine to fit particular requirements.

Our technical sales engineers near you will gladly supply further details.

Investigate the Straight-Through Moldmaster today.

Circle 580 on Page 53



Announcing

VALVAIR®
½" NPT
PLUG-IN
VALVES

MODEL PD-441 shown. 4-way single or double pilot-operated types, for sub-base or manifold mounting. Aluminum and stainless steel components assure multi-million cycle dependability. Interchangeable pilots, with coils guaranteed against burn-out for life of valve, fit any plug-in Speed King. Coils for ac or dc, any voltage . . . 35 — 200 psi range . . . integral junction box . . . optional manual over-ride, common or separate exhaust ports, sub-base connected external pilot supply . . . ¾ in. exhaust ports, ½ or ¾ in. inlet and cylinder ports . . . valve meets JIC standards.

Based on the service-proved design principle of the Speed King ¼ in. plug-in Valvair's ½ - ¾ in. plug-in valve series provides plug-in convenience and versatility to a wider range of control valve applications.

Electrical and pneumatic circuits are completed automatically when valve and pilot are plugged in . . . bolted down. The result — cost-cutting reduction of original installation and maintenance time. All power connections are made permanently in sub-base or manifold . . . there's no need to disturb piping or wiring for quick in-service maintenance.

What's more, advanced design shortens stroke . . . speeds response. Separate coded (4-wire) circuits on double solenoid models meet JIC requirements. Flow area through valve and sub-base equals that of full ½ in. pipe.

Whether your control valve applications are on the drawing board or now in service, it'll pay you to investigate the advantages of Valvair plug-in design. A call to your near-by Valvair field office will bring prompt application engineering recommendations.

For more information, write for Bulletin SPL. Address Dept. FO-760, Bellows-Valvair, Akron 9, Ohio

Bellows-Valvair

The Bellows Co. • Valvair Corp. Akron 9, Ohio

DIVISIONS OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

8098-3

Late News

TARIFFS: Products to be considered for possible U. S. tariff concessions at the next Geneva conference on General Agreement on Tariffs and Trade include ferrous castings and numerous products which have cast components. A request that no further reductions be made until careful consideration is given to all the factors which have put American-produced iron and steel products in a noncompetitive position has been presented to the United States Tariff Commission in a joint statement from the Gray Iron Founders' Society, Malleable Founders Society, and Steel Founders' Society of America.

BUSINESS: Some business indicators likely will look pretty drab during the next few weeks. Steel production will sag further in July. Shutdowns for vacations will be common for plants in many industries. Retail trade has been holding up well, construction contracts awarded have risen despite a downward trend in amount of work put in place, and employment and personal income are relatively high, comparing favorably with year-ago levels. Inventories of many products, including castings, are low because productive capacity is ample; increased consumption consequently will have a quick effect on producers of components.

SCRAP EASES: Ferrous scrap prices have tended irregularly downward during the last five months. Both iron and steel grades are quoted $1 to $3 a ton below levels of a month ago. Compared with prices of mid-1959, cast iron scrap today is off $3 to $12 a ton. Delivered price of No. 1 cupola cast scrap in most lead-

Foundry Statistics

Iron and Steel Scrap Consumption

(Gross tons*)

	All Scrap Total	By Types of Furnace — Cupola Total	Air Total	Electric Total
1958	50,242,746	7,725,970	821,388	7,153,726
1959				
Feb.	5,657,573	791,137	88,326	801,692
2 mo.	11,032,915	1,574,182	174,845	1,568,941
Mar.	6,677,499	873,982	101,956	965,048
Apr.	6,644,905	911,313	106,972	906,126
May	6,642,572	868,861	99,256	1,029,373
June	6,322,404	835,497	104,643	997,921
July	3,584,931	750,208	87,441	603,726
Aug.	1,875,165	691,798	81,184	374,878
Sept.	2,114,015	901,588	99,090	441,134
Oct.	2,266,709	795,569	98,279	445,137
Nov.	4,796,898	814,233	82,784	801,585
Dec.	7,021,870	843,040	99,577	1,006,158
Total	58,979,881	9,613,059	1,156,097	9,232,937
1960				
Jan.	7,043,488	823,442	95,442	1,055,159
Feb.	6,493,556	822,476	97,688	1,015,716
2 mo.	13,537,048	1,645,918	193,130	2,073,875

Index of Foundry Equipment Orders

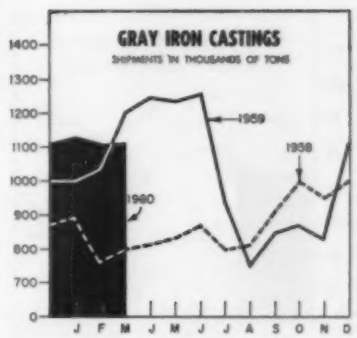
Foundry Trades Only

(Net Orders Closed, New Equipment)

	1959	1960
Jan.	127.4	95.5
Feb.	237.1	128.6
Mar.	166.6	159.9
Apr.	154.2	97.9
May	157.0	....
June	125.1	....
July	110.7	....
Aug.	134.1	....
Sept.	131.3	....
Oct.	140.8	....
Nov.	131.2	....
Dec.	95.9	....

Note: Base period 1947-49 taken as 100 per cent monthly average.

Source: Foundry Equipment Manufacturers Association.



GRAY IRON CASTINGS—SHIPMENTS

(Net tons†)

	All Castings — Total	All Castings — For Sale	Miscellaneous Castings Total	Miscellaneous Castings For Sale	Nodular Iron Castings Total	Heavy Steel Ingot Molds Total	Chilled Railroad Car Wheels Total	Pressure Pipe & Fittings Total‡	Soil Pipe & Fittings Total‡	Unfilled Orders§
1958	10,371,232	5,863,154	6,155,378	2,657,197	117,588	1,884,396	265,114	1,277,685	788,659	.....
1959										
Mar.	1,204,428	664,890	700,761	285,926	13,881	276,293	35,820	108,131	89,423	845,640
3 mo.	3,242,854	1,700,794	1,989,247	788,202	38,561	715,984	94,505	259,849	203,364	.....
Apr.	1,245,702	688,755	726,105	295,982	14,663	270,476	35,655	129,861	83,605	892,214
May	1,236,250	685,285	706,873	285,587	16,093	275,563	36,960	141,675	75,979	884,779
June	1,252,016	717,067	707,291	295,064	15,510	268,479	30,723	160,540	84,983	836,707
July	932,713	532,912	599,422	252,915	14,508	99,670	20,486	133,175	79,960	897,536
Aug.	743,564	506,756	485,444	254,232	11,946	13,482	18,479	145,853	80,306	872,993
Sept.	850,043	528,145	595,435	279,357	11,875	19,416	16,272	142,660	76,260	883,278
Oct.	871,779	520,322	622,599	277,927	17,797	20,155	19,647	139,716	69,662	886,970
Nov.	831,504	516,032	493,508	250,342	12,698	165,139	16,723	96,066	60,048	885,368
Dec.	1,107,741	584,516	650,145	271,221	14,651	294,129	20,595	92,139	50,733	845,575
Total	12,314,166	7,002,544	7,555,269	3,250,759	167,312	2,142,498	309,945	1,440,883	865,571	.....
1960										
Jan.	1,135,575	591,804	677,392	277,100	16,774	295,994	18,453	88,798	56,928	851,336
Feb.	1,107,721	571,143	678,927	279,190	16,430	284,738	17,848	76,332	49,876	855,334
Mar.	1,143,395	600,162	685,102	284,207	15,670	294,322	24,409	83,121	56,441	890,132
3 mo.	3,386,691	1,763,109	2,041,421	840,497	48,874	875,054	60,720	246,251	163,245	.....

*Source: U. S. Dept. of Interior Bureau of Mines. †Source: Bureau of Census. ‡For sale only. §All cast iron pipe is shipped for sale.

Prices of Foundry Metals and Coke

(As of June 27, 1960)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE

Connellsville	$15.00-$18.50

OVEN

Birmingham	$30.35
Buffalo	32.00
Detroit	32.00
Erie, Pa.	32.00
Indianapolis	31.25
Kearny, N. J.	31.25
Milwaukee	32.00
Neville Island (Pittsburgh)	30.75
New England, deld.	33.55
New Haven, Conn.	31.00
Painesville, O.	32.00
Philadelphia	31.00
St. Louis	33.00
St. Paul	31.25
Swedeland, Pa.	31.00
Terre Haute, Ind.	31.25

PIG IRON

(Per gross ton, f.o.b. furnace)

	No. 2 Foundry	Malleable
Birdsboro, Pa.	$68.50	$69.00
Birmingham	62.50	66.50
Boston, deld. (July 1)	75.70	76.20
Buffalo	66.50	67.00
Chester, Pa.	Nom.	Nom.
Chicago	66.50	66.50
Cleveland	66.50	66.50
Duluth	66.50	66.50
Erie, Pa.	66.50	66.50
Fontana, Calif.	75.50	....
Geneva, Utah	66.50	....
Granite City, Ill.	66.40	66.90
Neville Island (Pittsburgh)	66.50	66.50
Swedeland, Pa.	66.50	69.00
Toledo, O.	66.50	66.50
Troy, N. Y.	66.50	69.00
Youngstown, O.	....	66.50

NONFERROUS INGOT

(Cents per pound, carlots)

BRASS AND BRONZE: Red brass, No. 115, 29.25; tin bronze, No. 225, 39.50; No. 245, 34.00; high-leaded tin bronze, No. 305, 33.75; No. 1 yellow, No. 405, 23.75; manganese bronze, No. 421, 28.25.

ALUMINUM: 99 per cent plus primary ingots 23.10. Secondary No. 12 alloy, 23.75-25.00. Deoxidizing grades: No. 1, 25.00; No. 4, 22.25.

MAGNESIUM: 99.8 per cent notched ingots 34.00, f.o.b. Velasco, Tex. (10,000 lb or more).

COPPER: Electrolytic 33.00, delivered Connecticut valley.

ZINC: High grade 14.50, delivered. Die casting alloy No. 3, 16.25; No. 2, 16.75, delivered.

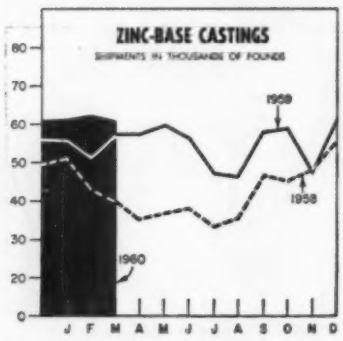
Iron and Steel Scrap

(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Clean Auto Cast	Machinery Cast	Malleable	Short Steel Rails
Birmingham	$28.00-29.00	$47.00-48.00	.....	.....	.....	.....	$45.00-46.00
Boston*	**25.00-25.50	**39.00-40.00	.....	.....	**40.00-42.00	.....	.....
Buffalo	30.00-31.00	**42.00-43.00	.....	.....	**48.00-49.00	.....	50.00-51.00
Chicago	30.00-31.00	40.00-41.00	.....	45.00-46.00	45.00-46.00	44.00-45.00	46.00-48.00
Cincinnati*	**26.50-27.50	**37.00-38.00	**32.00-33.00	.....	**49.00-50.00	.....	**52.00-53.00
Cleveland	31.00-32.00	44.00-45.00	30.00-31.00	50.00-51.00	50.00-51.00	48.00-49.00	50.00-52.00
Detroit*	**25.00-26.00	**36.00-37.00	**30.00-31.00	**43.00-44.00	.....	.....	.....
Los Angeles	37.00	41.00	.....	.....	.....	.....	.....
New York*	31.00-32.00	37.00-38.00	31.00-32.00	.....	.....	.....	.....
Philadelphia	34.00	41.00	40.00	.....	51.00-52.00	51.00	.....
Pittsburgh	30.00-31.00	39.00-40.00	.....	.....	48.00-49.00	.....	51.00-53.00
St. Louis*	31.00	45.00	35.00	47.00	.....	.....	43.00
San Francisco	34.00	46.00	28.00	40.00	40.00	.....	.....
Seattle	38.50	35.00	34.00	.....	.....	.....	.....

*Brokers' buying prices. **F.o.b. shipping point

Foundry Statistics



ZINC-BASE CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1958	590,071	409,471	.....
1959			
Mar.	57,600	40,700	62,657
3 mo.	164,407	114,839	.....
Apr.	57,325	40,127	55,916
May	60,656	43,920	62,224
June	56,128	40,226	54,097
July	46,756	34,606	52,877
Aug.	46,566	34,682	56,090
Sept.	58,144	40,397	60,953
Oct.	59,214	42,594	57,814
Nov.	46,720	37,410	58,076
Dec.	60,606	39,516	65,723
Total	656,529	468,317	.....
1960			
Jan.	61,537	39,777	64,940
Feb.	62,925	42,089	66,945
Mar.	60,816	39,618	60,267
3 mo.	185,278	121,484	.....

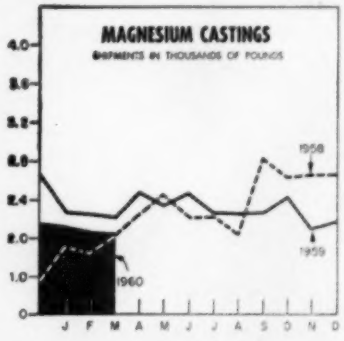
PIG IRON

PRODUCTION*—Net Tons

	Foundry	Malleable & Silvery	Low & Int. Low Phos. & Bessemer
1958	1,622,320	2,448,917	4,954,854
1959			
April	159,950	296,384	427,227
4 mo.	645,939	1,158,957	1,631,063
May	198,126	358,087	474,820
June	188,158	346,231	441,052
July	166,378	173,760	258,935
Aug.	N.A.	N.A.	N.A.
Sept.	N.A.	N.A.	N.A.
Oct.	N.A.	N.A.	N.A.
Nov.	148,660	180,927	216,063
Dec.	177,017	306,303	452,426
Totals[3]	1,589,445	2,810,359	3,471,683
1960			
Jan.	128,232	325,151	462,667
Feb.	145,238	338,866	471,755
Mar.	126,357	333,182	462,914
April	134,509	258,452	395,875
4 mo.[3]	537,336	1,258,373	1,793,211

CONSUMPTION*—Gross Tons

	Cupola	Air	Electric
1958	3,314,652	169,267	231,145
1959			
Feb.	324,876	17,960	37,414
2 mo.	646,178	35,073	74,197
Mar.	353,985	20,625	42,464
Apr.	366,378	21,997	41,597
May	358,192	20,424	40,812
June	366,136	20,390	39,867
July	311,327	16,391	20,437
Aug.	288,547	15,937	4,923
Sept.	336,015	18,057	6,033
Oct.	351,679	20,011	5,749
Nov.	276,168	16,350	28,231
Dec.	334,524	18,613	47,045
Total	3,989,129	223,868	351,355
1960			
Jan.	328,242	18,634	45,936
Feb.	322,945	19,257	42,883
2 mo.	651,187	37,891	88,819



MAGNESIUM CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1958	28,776	25,024	....
1959			
Mar.	2,129	1,924	4,465
3 mo.	6,669	6,005	....
Apr.	2,455	2,213	4,787
May	2,370	2,093	5,102
June	2,484	3,207	4,664
July	2,265	1,875	3,995
Aug.	2,243	1,753	3,809
Sept.	2,263	1,832	3,823
Oct.	2,436	1,890	3,501
Nov.	2,023	1,628	3,281
Dec.	2,163	1,731	3,423
Total	27,371	24,227	....
1960			
Jan.	2,135	1,588	3,209
Feb.	2,075	1,679	3,278
Mar.	1,903	1,524	3,208
3 mo.	6,113	4,791	....

*Source: U. S. Dept. of Interior, Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For sale only. [3]Monthly figures do not add up to totals shown because of unreported monthly revisions.

For Cleaner Surfaces, Better Shakeout, Try

WHITEHEAD'S NEW HYGEIA LYQUAFLOUR

Our new plant at Irwin, Pa., is producing the improved DUSTLESS DOUBLE STRENGTH HYGEIA LYQUAFLOUR. The compound of a special hydrocarbon and woodflour improves castings and mold conditions for all types of metal. Highly recommended for the advantages listed below:

- One sand additive controls both peel and expansion
- Good shakeout saves sand
- Imparts highest flowability to sand mixture to give pattern true finish
- 2% initial treatment of sand and as little as ¼ of 1% to reactivate does the job
- Replaces any carbon or hydrocarbon materials now used
- Eliminates dust at the muller
- Castings peel excellently which reduces cleaning room time
- Reduces penetration and burn-on
- Overcomes sand expansion defects, maintains good compression strength
- Improves molding, "feel", and "moldability"
- No rigid control required
- Permits hard ramming
- Less ramming required, more molds per hour
- Less temper water needed

Whitehead Brothers
COMPANY

Established 1841

NEW YORK OFFICE
324 West 23rd St., New York 11, N. Y.

NEW ENGLAND OFFICE
75 Westminster St., Providence 1, R. I.

Manufacturers of

LYQUAGRIP
Ready-to-use core paste

DUO RESIN
Binder for baking with controlled oven temperatures

JOINT SEAL
Plastic compound for perfect sealing

LYQUAFACE
The liquid sand grain coating

DOB-IT
Ready-to-use core mudding compound

Circle 582 on Page 53

How Ed Blumberg increased and cut wheel costs, too,

General Malleable of Waukesha, Wisconsin, is one of the finest foundries in the Wisconsin area. A large number of the castings they make are unusually intricate in design. Many of them are used in hydraulic systems calling for the highest possible standards of quality and finish. Dental mirrors are even used to detect imperfections and no shadows are allowed . . . period!

They were perfectly happy with the resinoid cone wheels they had been using . . . until Bay State Abrasive Specialist Ed Blumberg came up with a silicon carbide cone with vitrified bond that did a considerably better job. To be specific, it cost less to buy and lasted 35% longer, too. On top of that, as Cleaning Room Foreman Cliff Raymond says, "these vitrified cones have an exceedingly fast cutting action."

To quote Ed Blumberg himself: "It's surprising how often a simple change of wheel spec. can make a really substantial improvement in performance or in the cost picture . . . or both."

Maybe it's time to check *your* grinding operations. Your Bay State representative, direct or distributor, is an excellent man for the job . . . widely experienced and thoroughly trained. He's backed by Research and Development, Quality Control, and Abrasive Engineering second to none.

Better grinding at lower cost . . . that is our business.

Bay State's Edward W. Blumberg was an Abrasive Specialist for four years before joining Bay State in 1951. Before that, he had wide experience in the machine tool business so his knowledge of abrasive and metals is unusually broad as well as highly detailed.

grinding wheel life 35%
at General Malleable Corp.

Operator Raymond Hatch removes core fin from tractor clutch housing, using Bay State's fast-cutting silicon carbide cone wheel with vitrified bond.

Plant Superintendent Paul Dumbleton examines finished casting with Cleaning Room Foreman Cliff Raymond.

BAY STATE ABRASIVES

BAY STATE WHEELS of PROGRESS

Bay State Abrasive Products Co., Westboro, Massachusetts.
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Chicago, Cleveland, Detroit, Los Angeles, Pittsburgh. *Distributors:* All principal cities.

Circle 583 on Page 53

new look
(and greater efficiency)

in Magnetic Particle Flaw Detection Equipment

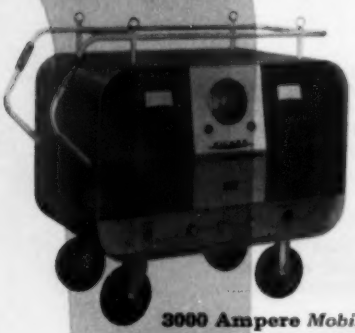
6000 Ampere *Stationary Model*
PICKER FERROSCOPE
for Wet Technics

new outside

- *Clean-lined modern design: easy to clean, easy to keep clean.*
- *Modular principle: units combine to handle parts up to 12 feet long.*
- *Meters and signals function-grouped at eye level.*

new inside

- *New heavy duty silicon full-wave rectifiers run cooler, quieter.*
- *Heat capacity five times greater than MIL Type II specs call for.*
- *Does away with noisy, grime-blowing exhaust fans.*



3000 Ampere *Mobile Model*
PICKER FERROSCOPE
for Wet and Dry Technics

new outside

- *Roll-to-the-job unit: companion design and same finish as big Ferroscope.*
- *Easy to read meters, husky control knobs.*

new inside

- *Same heavy duty cool-running silicon rectifiers as 6000 A. unit.*
- *Heat capacity fivefold greater than required by MIL Type III specs.*
- *Either AC or half-wave DC always on tap for best results with both wet and dry technics.*
- *Stepless current control up to 3000 A.*
- *All operation controllable at machine or by*
- *remote handswitch on long cable.*

For heavy duty inspection schedules, one or the other of these Ferroscopes may be just right for you. Or maybe a smaller Ferroflux or Portaflux portable magnetic particle inspection unit would be adequate to your lighter need. In any case, call in your local Picker representative: he will be glad to advise you about these, or any of the other nondestructive inspection systems Picker offers (they're listed below).

ONE STOP *for all this* | ***in non-destructive inspection equipment***

x-radiography	**ANDREX** portable x-ray units-140 KV, 160 KV, 200 KV, 260 KV **PICKER** x-ray units—35 KV Beryllium window, 90 KV, 110KV, 150 KV (stationary and mobile), 270 KV portable
gamma radiography	**PICKER** ***Pipeliner***—30 curies, Ir^{192}, ***Cyclops***—1500 curies; Co^{60} **TECH/OPS** Iridium^{192} units from 10 to 100 curies; Cobalt^{60} 3 to 100 curies: also Thulium^{170}, Cesium^{137}
fluoroscopy	**PICKER** Image Intensifier and associated equipment
magnetic particle	**PICKER** ***Ferroscope*** ***Ferroflux*** ***Portaflux*** **PIXmag** Ferropowders and pastes
dye penetrant	**PIXchek** Penetrants, Cleaners, Developers, and accessories

Picker x-ray

PICKER X-RAY CORPORATION
25 South Broadway, White Plains, N. Y.

Circle 584 on Page 53

From cradle to dry hearth, Hevi-Duty provides the right melting furnace for your job

Yes, Hevi-Duty can provide the furnace you need. It's probably a standard unit, for at Hevi-Duty you have a wide choice of sizes and types. If not, though, you've *still* come to the right place.

Hevi-Duty is a company of engineers, trained to solve heat processing problems and to design special equipment to meet your requirements. When you ask to see a Hevi-Duty representative, a man with application engineering experience will call on you. You can depend on him to recommend the most efficient system as well as the best furnace or oven for you.

So why not call on him. He will be glad to stop in, and you could be very glad he did.

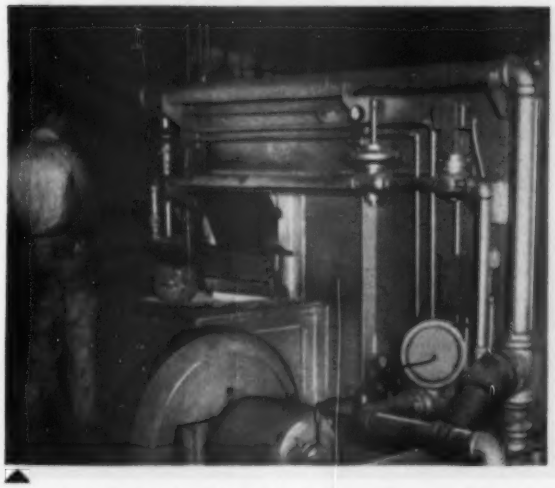
HEVI-DUTY

Electric and Fuel-Fired Industrial Furnaces and Ovens

BPC

A Division of Basic Products Corporation

Hevi-Duty Electric Company, Milwaukee 1, Wis.

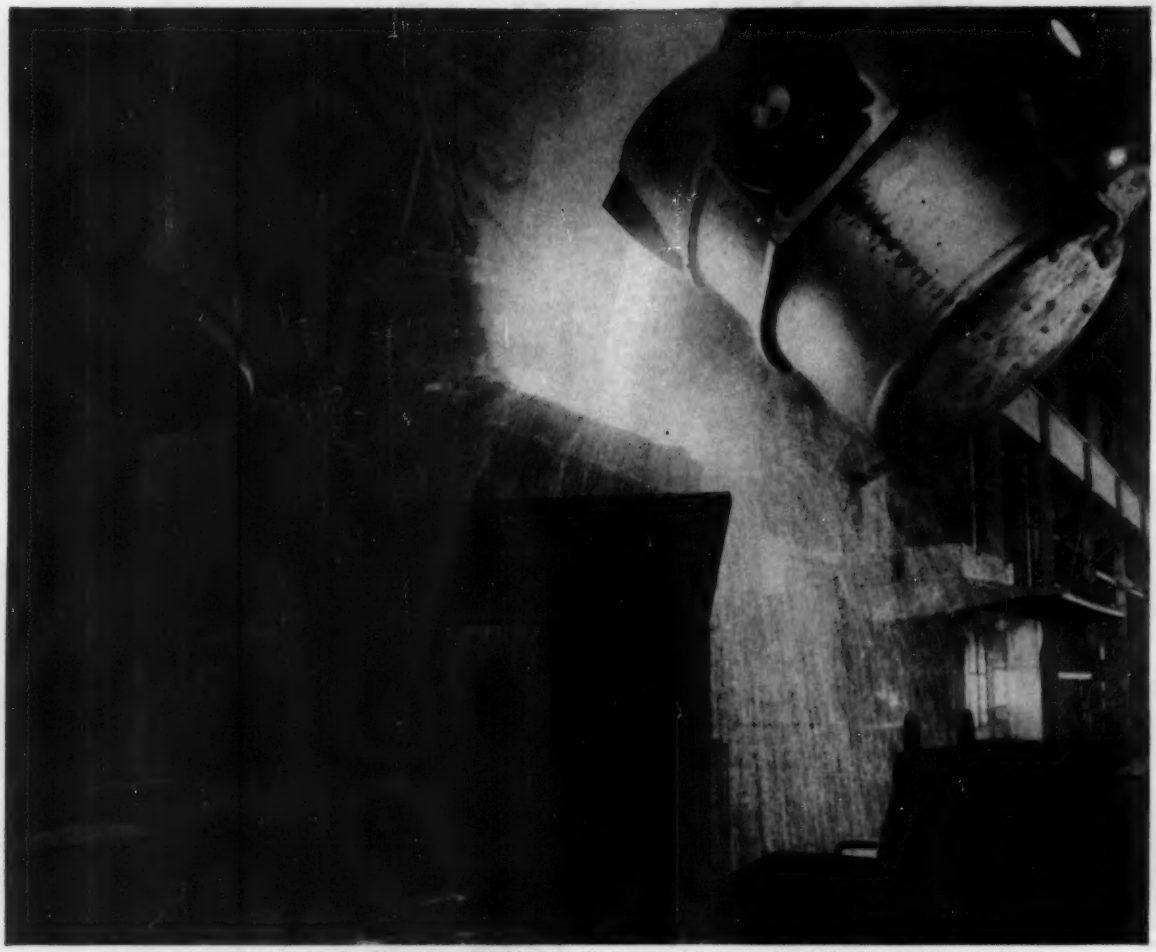


This double chamber dry hearth furnace was tailored to the specific needs of Eastern Castings Corporation, Newburgh, N. Y. It is used for permanent mold aluminum casting at temperatures up to 1550°F. For this high-temperature application, structural steel was moved to the outside of the shell and insulation was increased to accommodate the higher temperature. The user reports continuous, high production at tremendous savings on maintenance. ***For more information, please send for Bulletin 594.***

This dry hearth melting and holding furnace is used for many different aluminum alloys at Manufacturing Research, International Harvester Company. It is gas fired, has a melting rate of 750 pounds per hour and a holding capacity of 1,000 pounds. The pit beneath the pouring spout enables the company to pour castings as large as the holding capacity of the furnace. ***Request Bulletin 594.***

Dollin Corporation, Irvington, N. J., has purchased this cradle tilting reverberatory furnace for breaking down and holding aluminum. It handles a larger volume of metal at lower cost than the furnaces it has replaced. There is also a better balance of heat, resulting in cleaner metal. Working conditions are cooler near the unit, and its design provides for easy drossing. ***Please write for Bulletin 691.***

Circle 585 on Page 53



Seventy-ton ladle takes molten iron from Whiting continuous hot blast cupolas and pours it into converters.

It's Foxboro control for giant new Acme steel plant

Hot Blast Cupolas have capacity of 50 tons per hr. – operate continuously

Cupolas 67 ft. high by 10 ft. in diameter – the world's largest – are under Foxboro control at Acme Steel's new 35 million dollar plant at Riverdale, Illinois.

To keep hot blast cupolas operating at peak efficiency, Acme depends on Foxboro instrumentation. Foxboro temperature, pressure and flow recorders and controllers to keep air leaving preheaters at a constant 1200F. And Foxboro Air Weight Controllers, that meter blast air by weight instead of volume,to help cut fuel costs.

Furnaces, cupolas, preheaters — you'll find Foxboro instruments help operate them all more efficiently. Ask your nearby Foxboro Field Engineer for recommendations for your plant. Or write direct for a copy of Bulletin 13-18. The Foxboro Company, 327 Neponset Ave., Foxboro, Massachusetts.

Small-case Foxboro Consotrol® instruments (foreground) record and control preheater pressures, temperatures, flows. Preheaters were designed by Fabricating Engineering Co., Inc. *Reg. U. S. Pat. Off.*

FOXBORO

REG. U. S. PAT. OFF.

Circle 586 on Page 53

HINES POP-OFF FLASK FEMA

HINES STANDARD "POP-OFF" FLASKS

One of many HINES developments contributing to better foundry production

Perfect lightweight flasks for light casting work — pattern castings, test bars, hand-rammed molds, trade school work and light 10" jolt-squeeze jobs.

- HINES "POP-OFF" flasks are ruggedly built and reinforced with the familiar diagonal ribs.
- No need for hammering to remove the flask from the mold — simply move levers and off it pops!
- Serrations on inside surface of flask eliminate need for sand strips — sand is anchored so firmly there's no possibility of shift from vibration.
- Lengths and widths from 10" to 20". Depths from 7" to 12". Single or double, round, hex or "V" pins, bushings or guides — or pads for your own pins.

WRITE FOR CATALOG FOLDER NO. 204

THE HINES FLASK CO.

3431 WEST 140th STREET • CLEVELAND 11, OHIO

HINES FLASKS

Whatever you need in Chaplets or Chills . . .

FANNER puts its FACTORY

at your fingertips . . .

THROUGH THIS NETWORK OF EXPERIENCED REPRESENTATIVES AND DISTRIBUTORS

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Hill & Griffith Co.
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Frederic B. Stevens, Inc.
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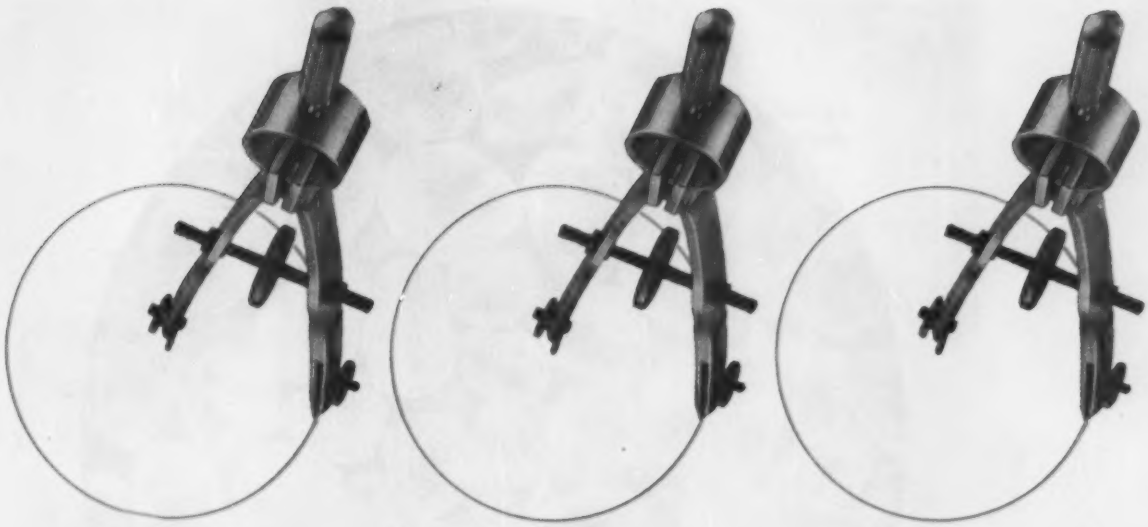
In the Fine FANNER Line there are thousands of different types and sizes of chaplets and chills, each designed to be best for its particular application. Yet you can have the chaplets or chills for your needs at your fingertips almost at a moment's notice through FANNER's nationwide network of distributors—or from FANNER direct. Both are equipped to assist you in the selection of the right chaplet or chill for your requirement . . . both are at your service. Write for Chaplet and Chill catalogs.

THE FANNER MANUFACTURING COMPANY

Designers and Manufacturers of Fine Fanner Chaplets and Chills

BROOKSIDE PARK CLEVELAND 9, OHIO



POSITIVE DUPLICATION—EVERY TIME!

As surely as a drawing compass can produce identical circles, you can be sure of getting Positive Duplication with these floor stand grinding wheels, and with *all* CINCINNATI (PD) ° SNAGGING WHEELS.

This predictable uniformity is the result of Cincinnati's unique 36-step (PD) manufacturing process. These rigid controls achieve tolerances for wheel inside diameters which are the "tightest" in the industry. Your (PD) WHEELS have better balance and last longer.

"PD" PAYS OFF FOR YOU

Your cleaning room costs will go down, when you start using CINCINNATI (PD) WHEELS. Our grinding specialists are at your service, to work with you in finding the best grading for your stand, swing frame and portable grinders. Once you have the (PD) WHEELS that give you the lowest labor and wheel cost, you can keep those costs down, because each reorder wheel will act and grind exactly like the original wheel . . . thanks to Positive Duplication.

CUT COSTS . . . CALL CINCINNATI

For experienced help on cutting costs, call your CINCINNATI (PD) GRINDING WHEELS Distributor, or contact Cincinnati Milling Products Division, Cincinnati 9, Ohio.

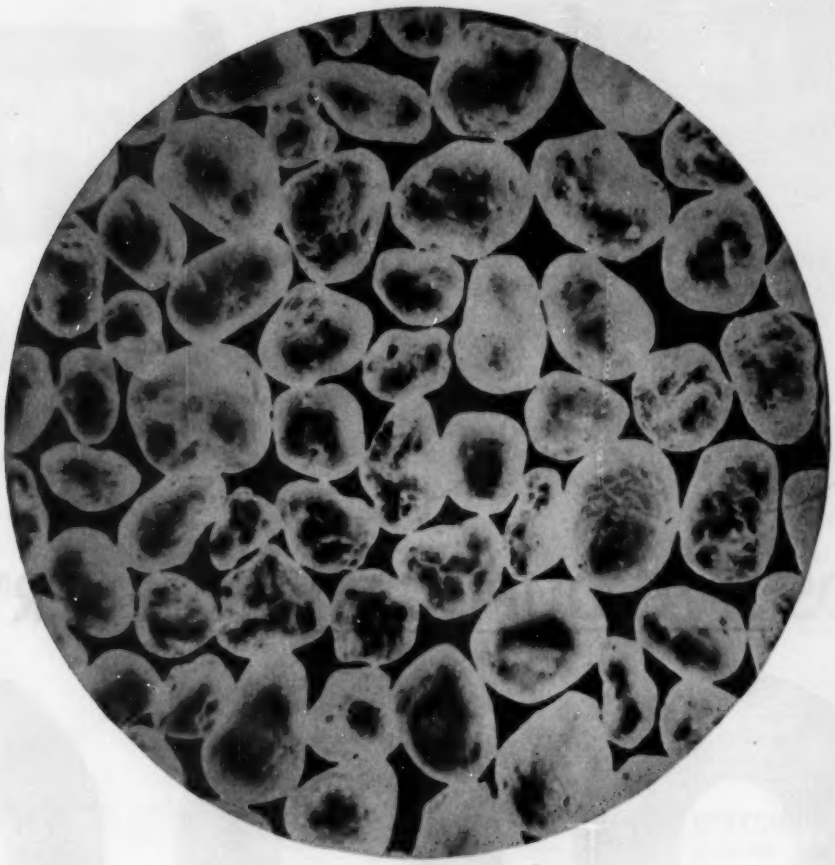
(PD) POSITIVE DUPLICATION

CINCINNATI® GRINDING WHEELS

*Trade Mark Reg. U.S. Pat Off.

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

Circle 589 on Page 53



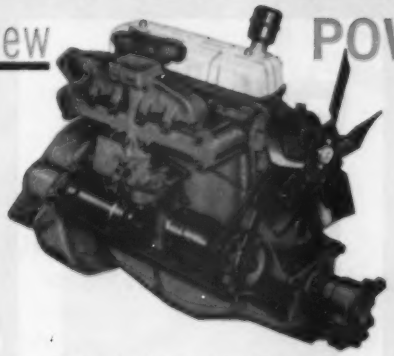
The sand in the microphoto above speaks quality. It's pure and fine, with the excellent rounded grain properties so desired for foundry use. This is indeed a superb sand—finest for foundries.

The obvious merits of quality can be yours with Wedron Silica

Send for illustrated brochure on Wedron sands.

3 NEW F series
ALLIS-CHALMERS LIFT TRUCKS

with new POWER-CRATER engine



Unique crater-shaped piston head in POWER-CRATER engine, built by Allis-Chalmers, sets up violent swirling turbulence, thoroughly mixing fuel and air. Because of this proper mixing, a higher percentage of fuel is transformed into useful energy. Thus, Allis-Chalmers F series lift trucks effect substantial savings in fuel.

POWER-CRATER and POWER-SHIFT are Allis-Chalmers trademarks.

Outstanding working ability and convenience

- Power, balance and weight distribution to climb steep grades
- Roller channel steel masts for smooth, fast lifting
- Simple, "easy-to-turn" steering, one-lever gear shift
- Pivoted steer axle for smoother riding, positive traction
- Comfortably wide, adjustable, ventilated-cushion seat
- Familiar automotive-type controls, key starting switch
- Positive, safe braking — two systems: large two-directional hydraulic brake, mechanical parking brake
- Solid 2" x 5" bar-steel, heavy-duty frame—foundation for long life and dependability
- Easy serviceability—seat tilts up for easy access to engine, clutch change in only 30 minutes, counterweight quickly removed
- Replaceable wet cylinder liners in engine save time and money
- Optional transmissions — standard or POWER-SHIFT drive

Let your dealer show you how new F series trucks do more, save more. Send for new bulletin BU-640. Allis-Chalmers, Milwaukee 1, Wisconsin.

BH-142

ALLIS-CHALMERS

POWER FOR A GROWING WORLD

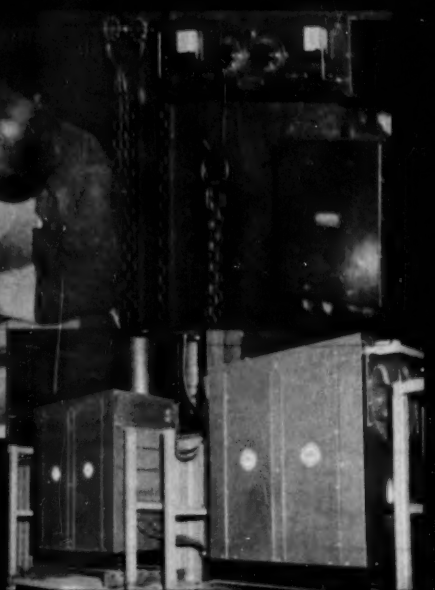
Circle 591 on Page 53

Foundries Find

miller-powered carbon arc cutting

Faster — Cheaper — Better

These photos, taken in well-known foundry, show operator carbon-arc cleaning a casting using an Arcair torch powered by a Miller SR-1000-A7. Note handiness of control console.



Battery of Miller SR-1000-A7's is located well away from cleaning room.

THE MILLER MODEL SR-1000 series, providing 1000 amperes of d-c at 40 arc volts, 100% duty cycle, has proved to be the ideal power source for Arcair and other foundry carbon arc cutting processes. Designed and built around Miller's exclusive semi-metallic, completely sealed Gold Star rectifier, drastic overloads are handled routinely without failure or deterioration. Control console is instantly removable to any reasonable distance. Adjustment of current range from 200 to 1400 amperes is accomplished under load. What's more, the operator can switch in a flash from cleaning and gouging to welding when needed. Operates from three phase power lines.

For applications involving carbon arc cutting, heavy submerged arc welding, plasma jet and electric furnace processes, the Miller SR-1000 series is probably without an equal. May we send you more complete details and specifications?

MODEL SR-1000-A7

miller ELECTRIC MANUFACTURING COMPANY, INC.

Distributed in Canada by Canadian Liquid Air Co., Ltd., Montreal

APPLETON, WISCONSIN

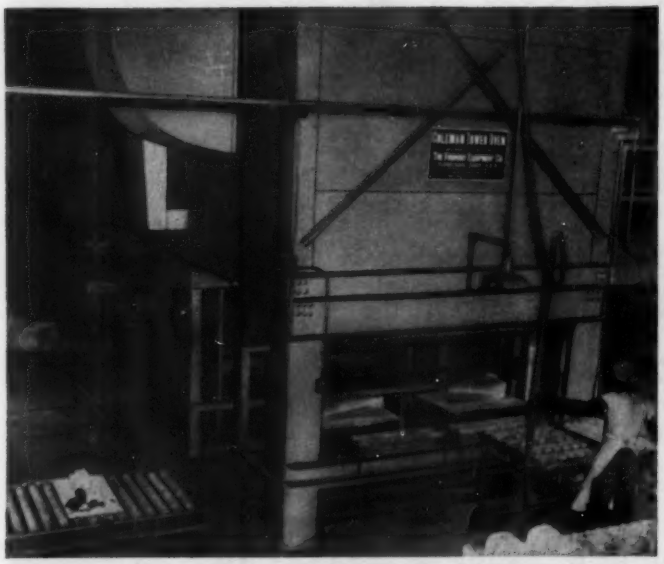
Where
maximum cleanliness is a "must"... EXLO® "75" Extra high in chromium and extra low in carbon, EXLO "75" is specially designed for use in very low-carbon stainless steels and heat-resistant alloys. There are two grades to choose from—.015% max. carbon and .025% max. carbon—both of which contain a minimum of 75% chromium. Because of its exceptional cleanliness, EXLO "75" is particularly adaptable to vacuum melting and other processes requiring minimum contaminant elements.

And don't forget the EXLO Standard Grades for use in low-carbon stainless and heat-resistant steels, irons and alloys. Like all EXLO ferrochromium alloys, they have high density and maximum cleanliness. Write for information or call your nearest VCA District Office. Vanadium Corporation of America, 420 Lexington Avenue, New York 17, N.Y. · Chicago · Cleveland · Detroit · Pittsburgh.

VANADIUM
CORPORATION OF AMERICA
Producers of alloys, metals and chemicals

CUT LABOR COSTS with Coleman Conveyor Core Ovens

Coleman Dielectric Core Oven in leading plumbing fixture foundry. Direct labor alone reduced by 75%, with many other important savings and advantages.



Coleman Tower® Core Oven. One of two large installations in a major steel foundry. Mechanized handling and baking of cores up to 150 pounds at substantial annual savings.

● **Performance records in all types of foundries prove that Coleman Conveyor Core Ovens reduce core department costs by as much as 50%!**

Coleman Ovens quickly pay for themselves out of direct savings in labor, materials and reduced casting scrap.

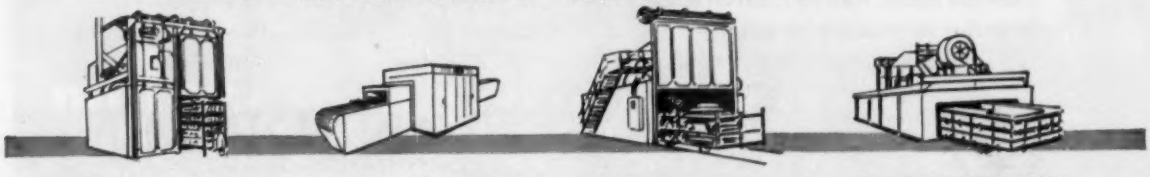
As builders of the world's only complete line of foundry ovens . . . dielectric or recirculating heat . . . we can recommend, without bias, the right oven for your particular needs.

WRITE FOR BULLETIN 54

THE FOUNDRY EQUIPMENT COMPANY • **1821 COLUMBUS ROAD, CLEVELAND 13, OHIO**

World's Oldest and Largest Foundry Oven Specialists—More than half a century of specialized foundry experience.

PART OF THE WORLD'S ONLY COMPLETE LINE OF FOUNDRY OVENS



TRANSRACK OVENS | DIELECTRIC CORE OVENS | CAR TYPE OVENS | JET ACTION MOLD OVENS

Gray Iron Foundry Milestones

In tribute to the great Foundry Industry, Pittsburgh Coke & Chemical Company has taken pleasure in presenting its version of Gray Iron Foundry Milestones. It is equally proud to serve the nation's foundry trade as a basic supplier.

Enlarged reproductions (11½ x 11", suitable for framing) of the illustrations above are available. Any one or a complete set of the etchings will be sent to you without cost, upon request.

COKE & IRON DIVISION

PITTSBURGH COKE & CHEMICAL CO.

GRANT BUILDING PITTSBURGH 19, PA.

Neville Pig Iron and Neville Coke for the Foundry Trade

2813

Circle 560 on Page 53

CORE HARDENING TIME CUT

from 3 hours to 15 seconds*

...WITH PURECO CO_2 "FLASH CURING"

The Pureco CO_2 *Flash Curing* process can mean extensive savings in time and money to you. Hardening time is cut from hours to seconds . . . no costly baking ovens or core driers are needed . . . valuable space is saved . . . more accurate castings with smoother finish result. Mold drying is eliminated . . . rapid production of finished cores expedite rush orders. In-plant handling time is drastically reduced.

For production or custom work.

Pureco can tailor a *Flash Curing* installation to meet your specific foundry requirements —large or small. Cost is low—installation simple.

Have a trial Flash Curing demonstration.

Pureco would like to demonstrate its *Flash Curing* process in *your foundry* under *your working conditions*, with no obligation on your part. Call your local Pureco man or write:

**Actual Pureco test*

PURECO CO_2

PURE CARBONIC

Pure Carbonic Company, A Division of Air Reduction Company, Incorporated
Nation-Wide Pureco CO_2 Service-Distributing Stations in Principal Cities
General Offices: 150 East 42nd Street, New York 17, N.Y.

AT THE FRONTIERS OF PROGRESS YOU'LL FIND AN AIR REDUCTION PRODUCT

Use These Cards . . .

FOUNDRY

- For more information on anything advertised in this issue
- For further data on products described in the Equipment and Supplies section (Page 97)
- To get copies of publications listed in the Literature for Foundrymen section (Page 134)
- To request extra copies of editorial articles

FOUNDRY — JULY 1960

77	431	461	491	521	551	581	611	641	671	701	731	761	791	821	851
402	432	462	492	522	552	582	612	642	672	702	732	762	792	822	852
403	433	463	493	523	553	583	613	643	673	703	733	763	793	823	853
404	434	464	494	524	554	584	614	644	674	704	734	764	794	824	854
405	435	465	495	525	555	585	615	645	675	705	735	765	795	825	855
406	436	466	496	526	556	586	616	646	676	706	736	766	796	826	856
407	437	467	497	527	557	587	617	647	677	707	737	767	797	827	857
408	438	468	498	528	558	588	618	648	678	708	738	768	798	828	858
409	439	469	499	529	559	589	619	649	679	709	739	769	799	829	859
410	440	470	500	530	560	590	620	650	680	710	740	770	800	830	860
411	441	471	501	531	561	591	621	651	681	711	741	771	801	831	861
412	442	472	502	532	562	592	622	652	682	712	742	772	802	832	862
413	443	473	503	533	563	593	623	653	683	713	743	773	803	833	863
414	444	474	504	534	564	594	624	654	684	714	744	774	804	834	864
415	445	475	505	535	565	595	625	655	685	715	745	775	805	835	865
416	446	476	506	536	566	596	626	656	686	716	746	776	806	836	866
417	447	477	507	537	567	597	627	657	687	717	747	777	807	837	867
418	448	478	508	538	568	598	628	658	688	718	748	778	808	838	868
419	449	479	509	539	569	599	629	659	689	719	749	779	809	839	869
420	450	480	510	540	570	600	630	660	690	720	750	780	810	840	870
421	451	481	511	541	571	601	631	661	691	721	751	781	811	841	871
422	452	482	512	542	572	602	632	662	692	722	752	782	812	842	872
423	453	483	513	543	573	603	633	663	693	723	753	783	813	843	873
424	454	484	514	544	574	604	634	664	694	724	754	784	814	844	874
425	455	485	515	545	575	605	635	665	695	725	755	785	815	845	875
426	456	486	516	546	576	606	636	666	696	726	756	786	816	846	876
427	457	487	517	547	577	607	637	667	697	727	757	787	817	847	877
428	458	488	518	548	578	608	638	668	698	728	758	788	818	848	878
429	459	489	519	549	579	609	639	669	699	729	759	789	819	849	879
430	460	490	520	550	580	610	640	670	700	730	760	790	820	850	880

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FOUNDRY — JULY 1960

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403	433	463	493	523	553	583	613	643	673	703	733	763	793	823	853
404	434	464	494	524	554	584	614	644	674	704	734	764	794	824	854
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406	436	466	496	526	556	586	616	646	676	706	736	766	796	826	856
407	437	467	497	527	557	587	617	647	677	707	737	767	797	827	857
408	438	468	498	528	558	588	618	648	678	708	738	768	798	828	858
409	439	469	499	529	559	589	619	649	679	709	739	769	799	829	859
410	440	470	500	530	560	590	620	650	680	710	740	770	800	830	860
411	441	471	501	531	561	591	621	651	681	711	741	771	801	831	861
412	442	472	502	532	562	592	622	652	682	712	742	772	802	832	862
413	443	473	503	533	563	593	623	653	683	713	743	773	803	833	863
414	444	474	504	534	564	594	624	654	684	714	744	774	804	834	864
415	445	475	505	535	565	595	625	655	685	715	745	775	805	835	865
416	446	476	506	536	566	596	626	656	686	716	746	776	806	836	866
417	447	477	507	537	567	597	627	657	687	717	747	777	807	837	867
418	448	478	508	538	568	598	628	658	688	718	748	778	808	838	868
419	449	479	509	539	569	599	629	659	689	719	749	779	809	839	869
420	450	480	510	540	570	600	630	660	690	720	750	780	810	840	870
421	451	481	511	541	571	601	631	661	691	721	751	781	811	841	871
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426	456	486	516	546	576	606	636	666	696	726	756	786	816	846	876
427	457	487	517	547	577	607	637	667	697	727	757	787	817	847	877
428	458	488	518	548	578	608	638	668	698	728	758	788	818	848	878
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Reader Information Service

Just mail one of these cards . . . for more information on anything advertised in this issue . . . for further data on products described in the Equipment and Supplies section (Page 97) . . . to get copies of publications listed in the Literature for Foundrymen section (Page 134) . . . to request extra copies of editorial articles.

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CUPOLA TO BULL LADLE

MOLDS POURED 2 to 3 TIMES FASTER

Both workers and management of many foundries are profiting by installations of Cleveland Tramrail. Hard lifting and carrying of heavy ladles are eliminated. Production is speeded and costs cut.

The photographs are of a typical installation. Large molds are poured with bull ladles carrying metal direct from cupola without repouring. Small molds are poured with 200 lb. mechanical ladles conveyed on Tramrail cranes. Four such ladles replaced many old type 50 lb. hand ladles.

Workers here are enthusiastic about Cleveland Tramrail equipment. It promotes their health and leaves them fresher at the end of a day. Management is happy because molds are poured 2 to 3 times faster than formerly.

POURING LADLE TO MOULDS

Heat loss is less because pouring ladles are larger and metal reaches molds in faster time.

GET THIS BOOK!

CATALOG No. 2008 gives construction and engineering details. Profusely illustrated.

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
3822 East 286th Street Wickliffe, Ohio

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

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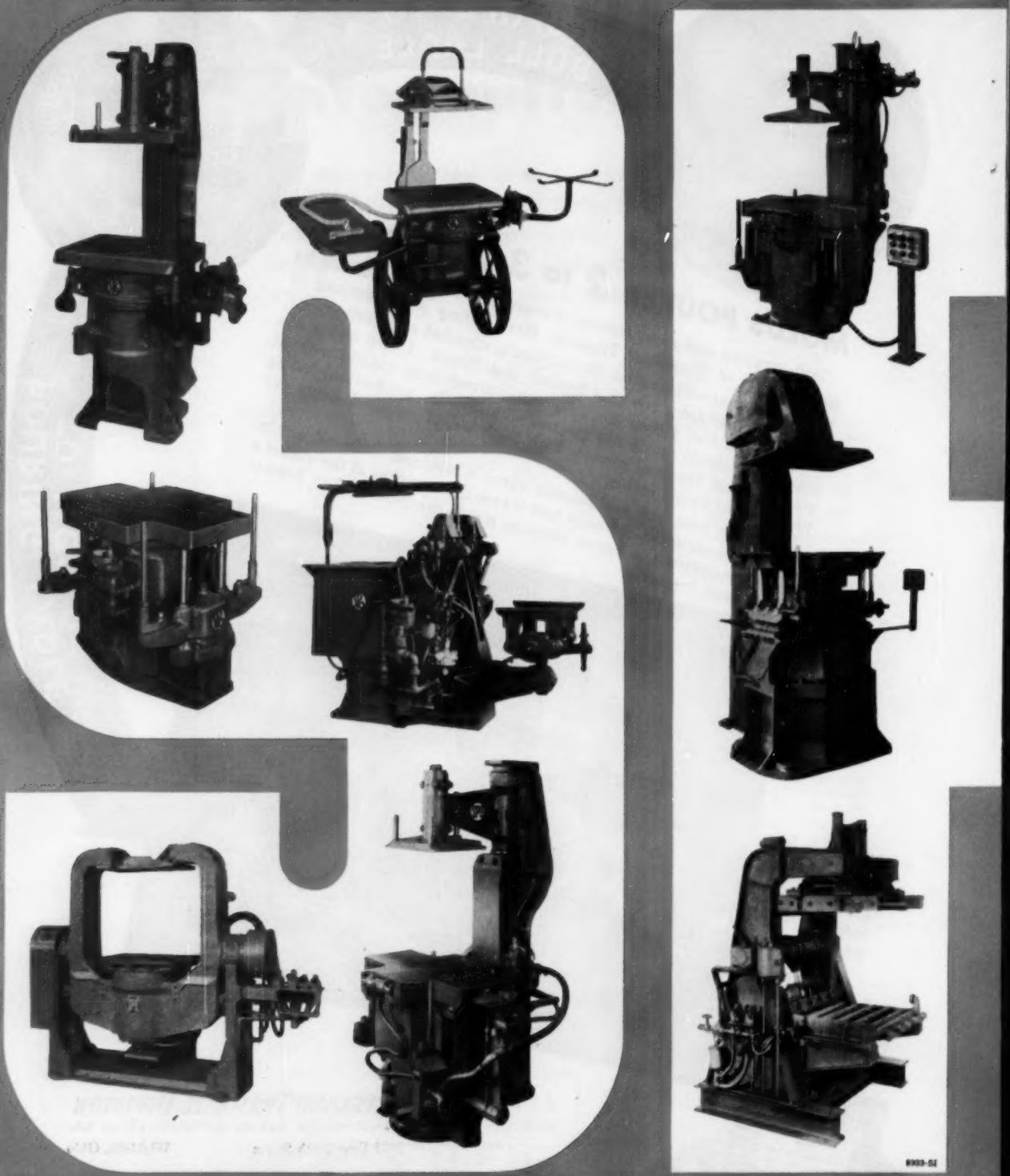
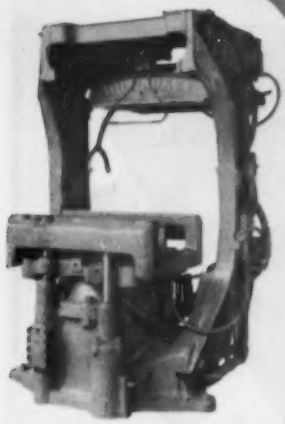
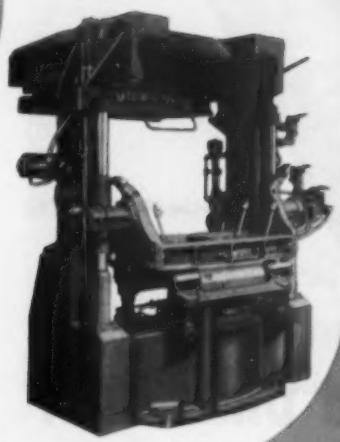
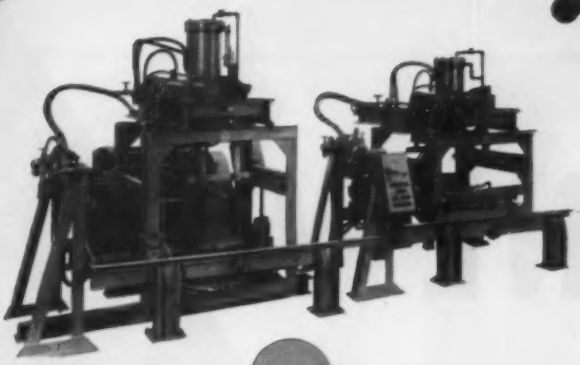
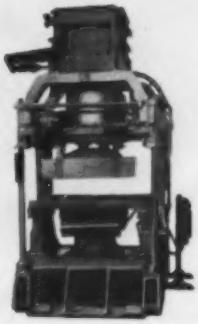


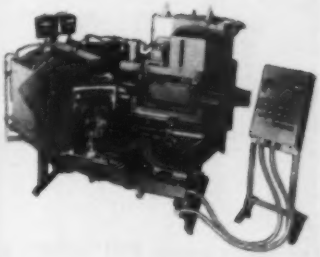
*** The world's largest supplier of molding machines**

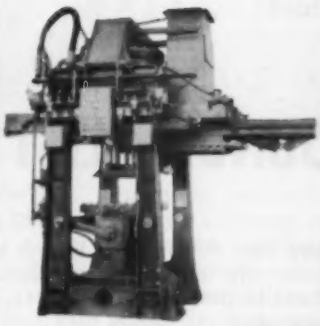


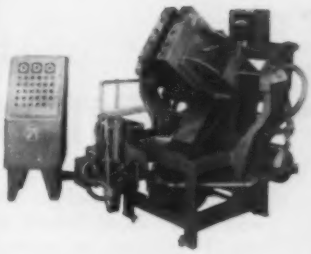


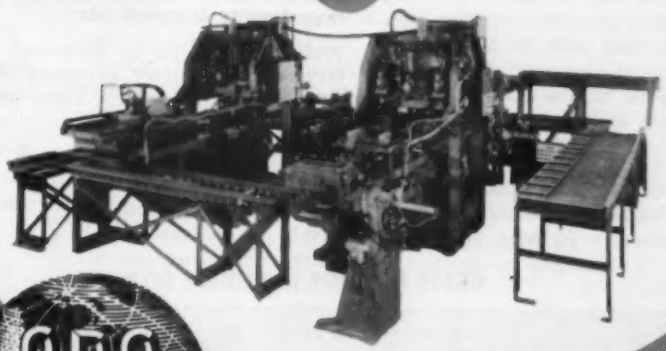












In specialized industries, leadership cannot be assumed . . . it must be earned through capability and accomplishment.

In foundry molding systems, for example, technological advances achieved by SPO . . . through Creative Engineering . . . have set the pace of molding progress during the past decade.

Creative Engineering is the keynote to SPO's leadership. It is the reason SPO can supply versatile, efficient, economical "packaged" systems, including Turnkey facilities, to meet every molding requirement. As the world's largest supplier of molding machines, *SPO is the best qualified to help analyze and solve your specific production problems.* This capability is another hallmark of leadership.

SPO

SPO INCORPORATED

6448 GRAND DIVISION AVENUE • CLEVELAND 25, OHIO

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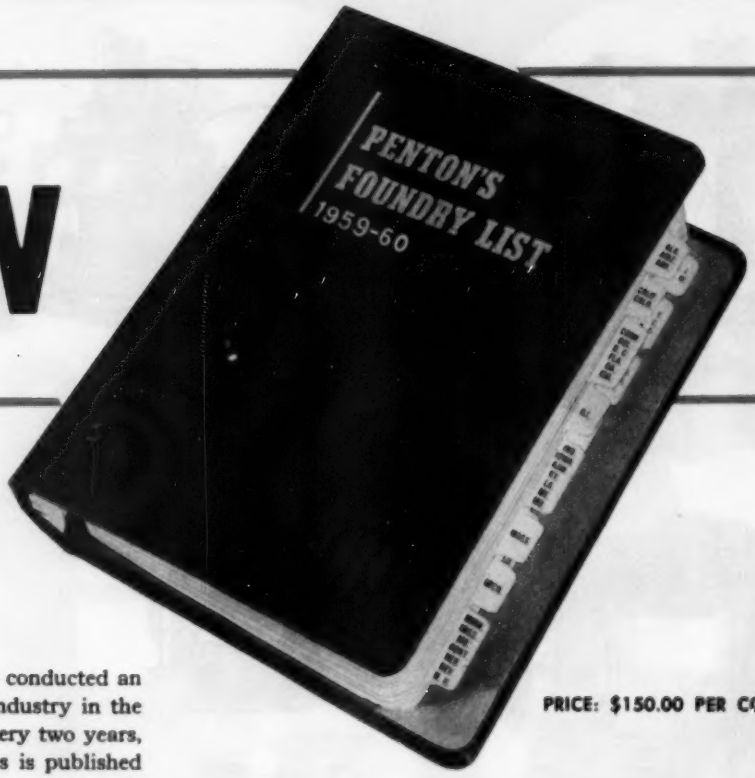
NEW



For many years, FOUNDRY has conducted an intensive census of the foundry industry in the United States and Canada . . . every two years, basic information on all foundries is published in . . .

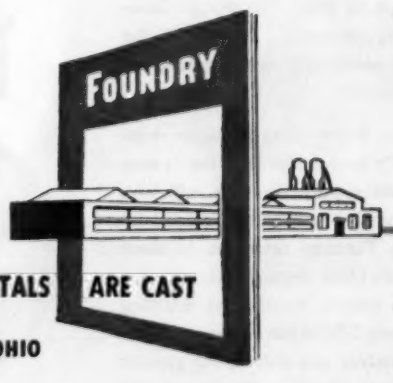
PRICE: $150.00 PER COPY.

PENTON'S FOUNDRY LIST and DIRECTORY

The new 1959-60 edition of PFL is now available. The new directory gives comprehensive information on all 6,085 metal casting plants in the U.S. and Canada (including diecasters). It tells who they are and where they are located; what metals they cast; their melting equipment capacities: departments operated; etc.

Well-indexed, and in loose-leaf form, PFL is indispensable to casting buyers and foundry suppliers. Send your order to: Book Department, FOUNDRY, 1213 West Third St., Cleveland 13, Ohio.

ORDER NOW FOR IMMEDIATE DELIVERY



Helping You Sell To Foundrymen

WHEREVER METALS ARE CAST

A PENTON PUBLICATION. PENTON BUILDING, CLEVELAND 13, OHIO

Circle 597 on Page 53

"This H-25 PAYLOADER® is a key machine in our operation"*

*Mr. Bill Roberts, V. P. of The Markey Bronze Bushing Company at Delta, Ohio, says, *"We couldn't cut sand and haul back to our molders without our H-25. It's a key part of our operation. It would take at least seven more men to replace it in the sand operation alone."*

John Stromberger, General Plant Foreman adds, *"I like the roll-back action of that bucket. Our operators like the machine and it gives good service. It handles easily, and is very maneuverable — working in and out of tight places well."*

Increasing production demands at The Markey Bronze Bushing Company resulted in the replacement of an old Model HA "PAYLOADER" with a Model H-25. This new tractor-shovel with its greater operating capacity (2,500 lbs.) power-shift and power-steer provided the required production boost along with easier operation. It has won the approval of management and machine operators alike and, in spite of its larger capacity, has an even shorter turning radius (6 ft.) than the HA. It delivers sand to the molding stations and to hoppers . . . handles bronze scrap and other materials . . . does plant maintenance in the machine shop and foundry . . . hauls machinery.

A Size for Any Job: The model H-25 is one of many modern and proven "PAYLOADER" tractor-shovels including 4-wheel-drive types up to 12,000 lb. operating capacity — a size for any materials handling job, indoors or outdoors.

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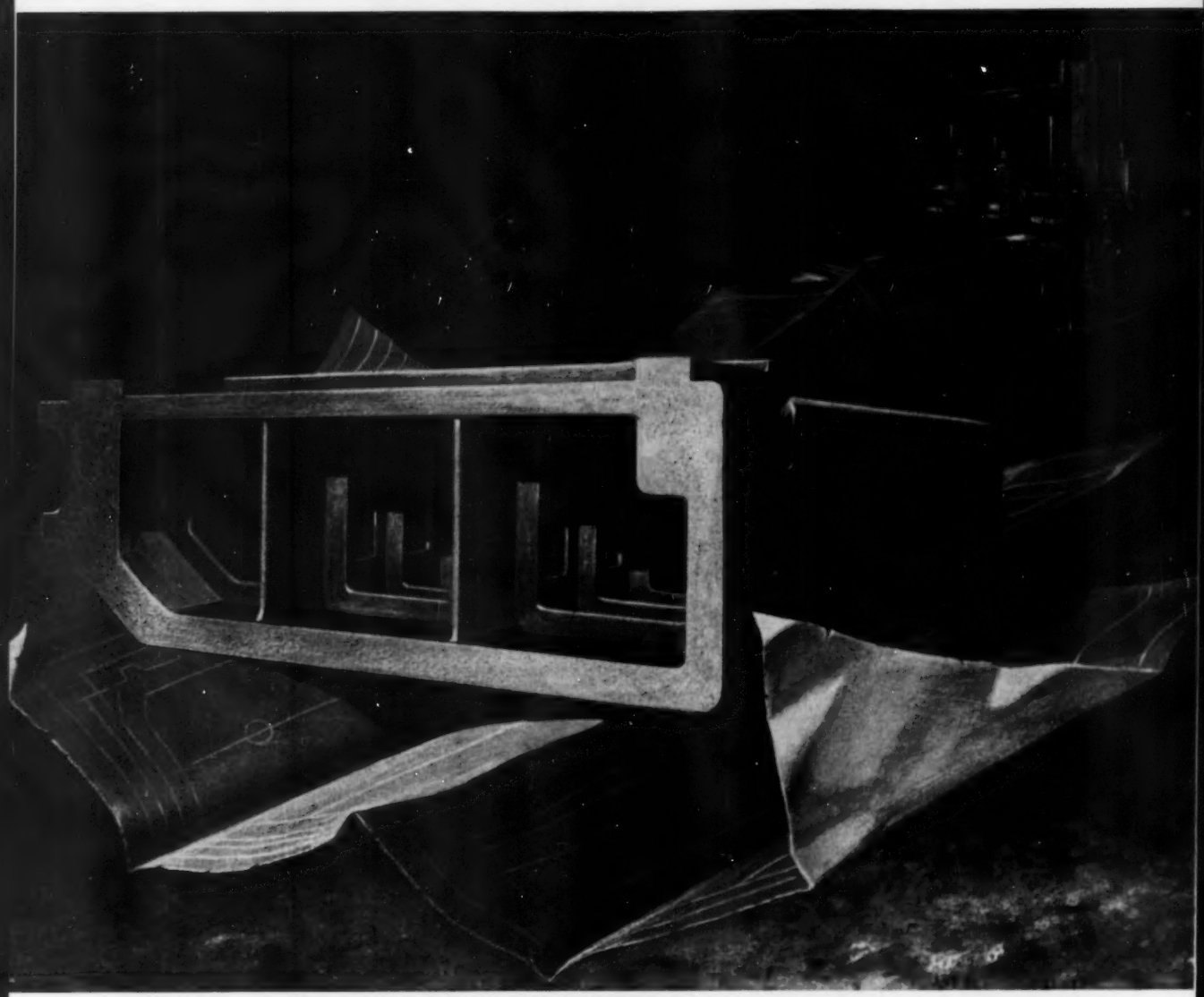
How the Foundry Industry Serves America . . . #7 of a Series



EVEN ON A SHORT RUN, IRON CASTINGS BEAT FABRICATING COSTS BY $2,984

Originally the right- and left-hand columns for this new heavy-duty planer were designed for weldments at a cost of $10,400 each. However, the blueprints indicated some difficult-to-weld elements. So, despite the fact that there was only a short run of two orders, the cost-saving possibilities of gray iron castings were thoroughly explored.

The cost of making sectional core boxes for both the molds and the cores came to $7,000. With the cooperation of the foundryman and pattern maker, they were made reversible to obtain either a right-hand or left-hand casting. The total production cost for two pairs of the 16,900-lb. gray iron castings, including patterns, came to only $17,816 vs. $20,800 for welded columns . . . a measurable savings of 14.3%.

This is just another example of how the intelligent use of versatile iron castings can solve many short run industrial design problems, and effect important fabricating economies at the same time.

For the production of structurally sound iron castings, Hanna Furnace provides foundries with all regular grades of pig iron . . . foundry, malleable, Bessemer, intermediate low phosphorous, as well as HANNA-TITE® and Hanna Silvery.

Facts from files of Gray Iron Founders' Society, Inc.

HANNA
THE BEST KNOWN NAME IN IRON

THE HANNA FURNACE CORPORATION

Buffalo • Detroit • New York • Philadelphia

Hanna Furnace is a division of **NATIONAL STEEL CORPORATION**

Circle 599 on Page 53

Readers' Comment

Error in Diagram Caption

To THE EDITORS:

With reference to the April 1960 issue of your usually excellent journal, I should like to inform you of a gross discrepancy in an article written by W. M. Moore entitled "Metallurgy of Iron Castings."

In the equilibrium diagram, published in this article, of the "Fe-C" system, it appears that the metastable "iron-carbide" system exists at a higher temperature than the stable "iron-graphite" system. This is at complete variance with the accepted laws of thermodynamics. We find that on referring to *Constitution of Binary Alloys*, M. Hansen and *Principles of Physical Metallurgy*, by G. Doan, it appears that your published diagram is incorrect.

C. D. DESFORGES and N. A. WRAGG
47 *Raeburn Way*
Sheffield 14, *England*

Editor's Note: Although the diagram is correct, the caption and text reference to it inadvertently transposed identifications of the two lines. The solid line represents the metastable iron-carbide system and the broken line the stable iron-graphite system.

Jules Verne, Foundryman

To THE EDITORS:

Have been reading your publication and find it interesting. In seeking further information on foundry work, I picked up a book at the library which had an article about a casting 900 ft long with a 9 ft ID and a 21 ft OD. The casting required 136,000,000 lb of iron and was poured in one heat.

All this is on page 84 of *From the Earth to the Moon*, written by Jules Verne in 1860.

O. M. CHEESEMAN
Box 397
Joshua Tree, Calif.

Editors' Note: Author Verne's calculations and ours do not agree. We find the weight of the gun casting to be about 114½ million lb rather than his 136 million. Thinking that Verne's figure might be for the combined casting and risers or feeders, we examined *From the Earth to the Moon* but found that the weight applied only to the casting.

Perhaps Verne's fertile fancy developed an iron which was about 19 per cent heavier than that available today. That is not too unlikely since in another section of the book the proposed aluminum projectile to be fired from the gun, Columbiad, was stated to be 108 in. in diam with walls 12 in. thick and weighing 19,250 lb. That would be a metal about 43 per cent lighter than the present-day aluminum.

Further, the iron used for the gun casting apparently retained its fluidity much longer than it does today; Verne mentions it was melted in 1200 "ovens" arranged in a circle 2 miles in diam around the mold 900 ft deep in the earth.

Adding Sodium to Aluminum

To THE EDITORS:

We have noted your excellent summary concerning the addition of sodium to aluminum alloys on Page 182 of FOUNDRY's May 1960 edition.

We should like to call your attention to the Foseco product, Napac, which was designed specifically to eliminate the many problems associated with the addition of metallic sodium to aluminum alloys.

Quite naturally, Napac must be plunged under the melt as you describe, but the handling difficulties and storage problems normally encountered using metallic sodium are eliminated.

We would also like to point out that although we agree with you that the addition of metallic sodium to aluminum alloy in an induction furnace is to be avoided if possible, a number of our customers are successfully making the addition in induction furnaces, using our product.

R. A. WELLS
Technical Service Engineer
Foundry Services Inc.
P. O. Box 8728
Cleveland 35, *Ohio*

What the Buyer Expects

To THE EDITORS:

I want to thank you for thinking of our request for additional copies of "What the Castings Buyer Expects of the Foundry."

We feel that every man working for us should be aware of its contents and are glad to be able to distribute this many more.

EUGENE HERVEY
President
Winters Foundry & Machine Co., Inc.
Canton 5, *Ohio*

In the interest of the American foundry industry, this ad (see opposite page) will also appear in

STEEL
IRON AGE
MODERN CASTINGS
AMERICAN METAL MARKET

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REPRINTS OF THIS AD WITH YOUR FIRM'S SIGNATURE

If you would like to have reprints of this ad to mail to your customers and prospects, let us know. Reprints will have no Hanna product message or signature, but will be imprinted with your firm name and address. Absolutely no obligation. To order your reprints, fill in and mail the coupon below.

The Hanna Furnace Corporation
Detroit 29, Michigan

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Sterling's all-time heavyweight champion

Extra Heavy Duty

FOUNDRY FLASK

...always the huskiest performer on any foundry floor

BUILT TO ENDURE

PERFORMANCE-PROVED BENEFITS OF THIS ADVANCED STERLING DESIGN

- Individually Engineered
- Oversize Flanges — Extra Thick, Extra Wide
- Heavier Walls — Heavier Solid Reinforcing
- Flanges and Lateral Reinforcing Members Automatically Welded to Flask Walls
- Stress Relieved if Desired
- Jig-Welded Fittings
- Precision-Machined Surfaces
- Accurately Installed Pins and Bushings

For sheer brute strength and endurance... none today can match Sterling's extra heavy duty flask construction. Product of an extensive laboratory and field research program, this outstanding development coordinates in one unit many of the important breakthroughs in metallurgy, welding and design.

In every detail, advanced techniques, extra safety factors and high-performance engineering concepts are included in this design to assure unmatched endurance and long service. In accuracy, too, low-tolerance machining of flanges combined with accurately-matched pins and bushings help to produce castings capable of meeting today's rigid specifications. Here's proof again that, when profits are at stake, it always pays to depend on Sterling.

AD-4938

Circle 600 on Page 53

STERLING NATIONAL INDUSTRIES, INC.
Founded in 1904 as Sterling Wheelbarrow Co.
Milwaukee 14, Wisconsin, U.S.A.

Associate: STERLING FOUNDRY SPECIALTIES LTD.
LONDON • BEDFORD • JARROW-on-TYNE, ENGLAND

Sterling
WORLD WIDE SERVICE

FOUNDRY
JULY 1960

Technicians Needed

Have you noticed recently that technical needs of various groups, such as military or manufacturing, frequently are indicated in terms of engineers and technicians? Usually, if numbers are given, the requirements for technicians exceed those for engineers by at least five to one.

Since foundrymen may not clearly distinguish between the two classifications of technical talent, let's look at these definitions developed from reports of the Technical Institute Division, American Society for Engineering Education:

"An engineer is a graduate of a four or five-year degree-granting engineering college program. He is characterized by his ability to apply creatively scientific principles to the design and development of structures, machines, apparatus, or manufacturing process.

"An engineering technician is a graduate of a technical-institute-type curriculum (usually 2 years) as accredited by the Engineer's Council for Professional Development or recognized equivalent." (This type of training was described in June FOUNDRY, Page 222.)

In the foundry industry, the engineering technician fills such roles as metallographer, sand technician, draftsman, quality control supervisor, time study man. He is also concerned with the areas of melting, metallurgy, operation of equipment, and casting layout—in all cases supplementing the work of the engineer.

FOUNDRY has pointed out many times the need for more engineers in our industry. Although great progress has been made in the last ten years, this need grows rather than diminishes.

Nevertheless, foundrymen could get better values from their staff engineers if more engineering technicians were employed to carry out the planning and take over details. These smart young folks are excellent recruits for our industry, or for any industry that wants to develop and grow.

The Foundry Educational Foundation is working toward a program of cooperation with leading technical institutes that will provide an increasing number of technicians with foundry training. Some companies, seeing the growing importance of this field of technical manpower, are making special gifts to further this phase of the FEF program.

If more companies would consider adding to these funds, and more foundries would study the possibilities of employing engineering technicians, the foundry industry would be taking a long step forward.

Frank G. Steinebach
Publisher
Editorial Director

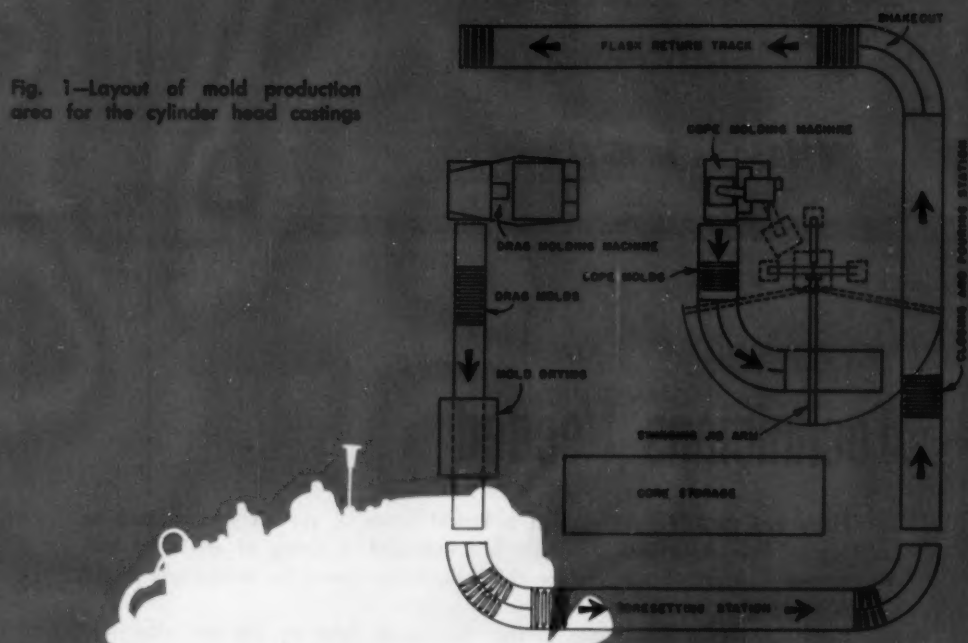


Fig. 1—Layout of mold production area for the cylinder head castings

Sand Casting Aluminum for the ROLLS-ROYCE V-8

By ALAN S. BRETT
Personal Assistant to Works Director
Birmingham Aluminum Casting (1903) Co. Ltd.
Smethwick, England

Fig. 2—Bottom-half jacket core being checked for depth and position relative to cores already laid

Fig. 3—Checking position of four exhaust cores to insure correct venting. Cores are jig located

● USE OF ALUMINUM for automobile components has increased steadily in recent years because of improved production techniques, the development of new alloys, and reduced economic competition from other materials.

The inherent qualities of the material are well known—particularly its high strength-weight ratio, which allows a considerable weight reduction in most components. It was this factor, in addition to those listed before, which led to the design of a sandcast V-8 aluminum engine in the 1960 Rolls-Royce.

An indication of what can be achieved is that this engine weighs no more than its cast iron 6-cylinder predecessor, although its swept volume of 6230 cu cm is 27 per cent larger.

These advantages can be exploited only if the design takes into account the different characteristics of aluminum and cast iron—especially the light alloy's lower values for Young's Modulus (E) and fatigue strength. The V-8 makes full use of the current casting processes available. The cylinder head, crankcase (or block), clutch housing, and steering box are typical of the castings produced by sand molding techniques in aluminum alloy.

This article will deal with the production of two of these castings, the crankcase and the cylinder head, both of which are produced in the foundry of Birmingham Aluminum Casting (1903) Co. Ltd., Smethwick, England.

The company's sand foundry is designed for small-batch production on a semimechanized basis, and the range of castings produced varies from a few ounces to several hundred pounds.

Alloy—Composition of the alloy is covered by British Standards Institution Specification BS.1490/LM.8. It is of the magnesium silicide type which responds extremely well to various heat treatments. Therefore it can be offered in various forms with mechanical properties which differ over a wide range. This characteristic makes it possible to produce the exact properties the designer requires. Castability of this alloy also is very good, and consistently homogeneous castings are produced at a very low scrap frequency.

Analysis shows the following composition: Copper, 0.1 per cent max; magnesium, 0.3-0.8 per cent; silicon, 3.5-6.0 per cent; iron, 0.6 per cent max; manganese, 0.5 per cent max; nickel, 0.1 per cent max; zinc, 0.1 per cent max; lead, 0.1 per cent max; tin, 0.05 per cent max; titanium, 0.2 per cent max; aluminum, remainder. This material is used in the heat treated condition, as will be described later.

Melting Procedure—Melting down is done in an oil-fired crucible furnace with a 600-lb steel pot. All steel faces in contact with the melt are coated effectively to prevent contamination of the aluminum. A proprietary flux is dusted over the surface of the charge to form a protective cover.

Metal treatment begins at 1328° F, when 0.375 per cent of degassergrain refiner is plunged below the metal surface in a perforated tablet holder. When the action has subsided, the temperature is increased to 1364° F, and the metal is degassed by passage of dry nitrogen through it for 10 minutes before dross and the associated flux cover are skimmed off. After 10 minutes of standing time, the crucible is transferred to the casting cradle.

Casting temperatures of 1364° F and 1355° F are used for the crankcase and cylinder head, respectively. Temperatures are checked with an immersion pyrometer.

Mold Materials—Two types of sand are in current use. Molding sand is a natural red Bunter sand quarried locally at Bromsgrove, Worcester, England. Core sand is a clay-free silica sand quarried at Congleton, Cheshire, England.

TABLE I—Molding Sand

Sieve Numbers*	Percentage Retained
8 mesh	....
16	....
30	0.012
44	0.16
60	2.32
72	11.28
100	35.55
150	21.5
200	8.472
300	8.86
Pan	2.6

*British Standard

Molding Sand—The Bromsgrove sand is used for all molds throughout the foundry since it gives good

Fig. 4—Completely assembled mold. Five small cover cores are positioned to complete the assembly

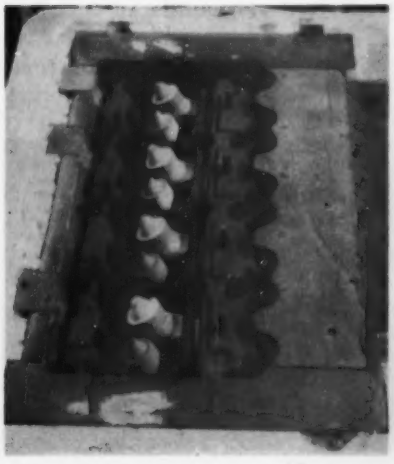
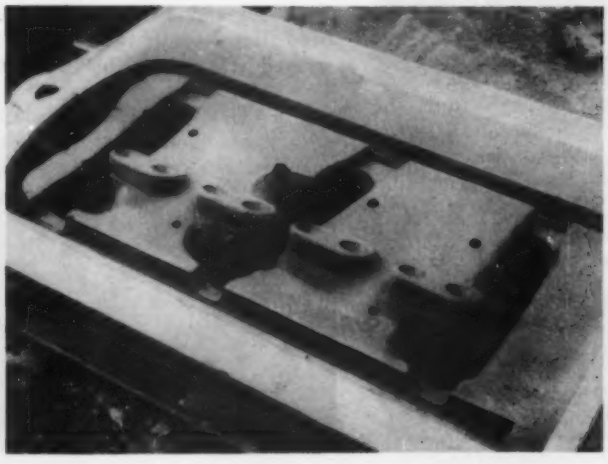


Fig. 5—Cope mold ready for closing. A gas torch is used to warm the mold before closing and pouring



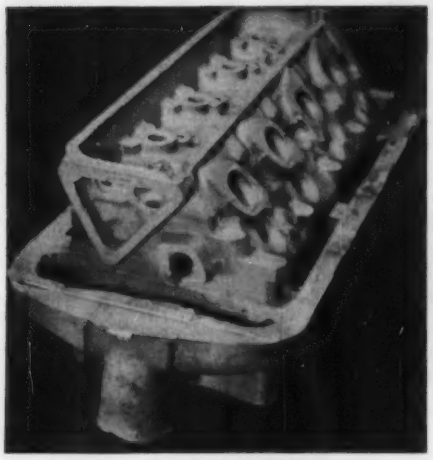


Fig. 6—View of casting showing the runner system. As-cast weight is 76.5 lb; finished weight is 35 lb

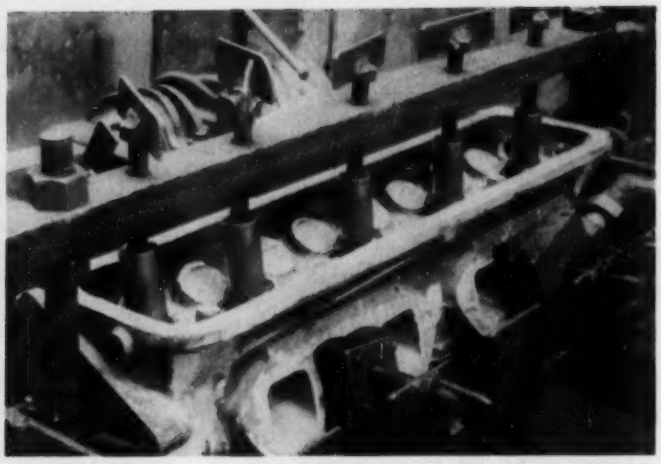


Fig. 7—Casting placed in a jig for a compressed air pressure test of 25-30 psi while under water

TABLE II—Core Sand

Sieve Numbers*	Percentage Retained
8 mesh	
16	0.020
30	0.760
44	5.872
60	33.288
72	29.740
100	18.860
150	9.254
200	0.840
300	0.388
Pan	0.026
Clay content	0.25 per cent

*British Standard

surface finish combined with good handling qualities. It has a clay content of 10-15 per cent with permeability of about 35 AFS. Table I shows the grain fineness distribution.

Facing sand is prepared in a 600-lb, batch-type mill by adding 40 per cent new sand and 60 per cent backing sand to each mix. Typical properties are as follows: Green strength, 14 psi; AFS green permeability, 35; moisture, 5.0-6.0 per cent.

Core Sand—Congleton sand is a uniform and consistent silica sand used for all cores produced in the foundry. All incoming sand is passed through an oil-fired, rotary drum-type dryer to remove excess moisture before it is bonded with either a molasses-type core oil or a sodium silicate binder which is cured with CO_2. Table II shows the grain distribution of this sand.

The sodium silicate-bonded core sand mix contains 100 lb sand, 3.25 lb sodium silicate, 0.25 lb plumbago, and 0.50 lb molasses. Milling time is 5-7 minutes.

Typical properties are as follows: Green strength, 1.28 psi; AFS green permeability, 71; gassed tensile strength, 22 psi; and moisture, 0.5 per cent.

Core sand mixes made with molasses-type core oil contain 100 lb sand and 2 lb core oil. Milling time is 7 minutes.

Typical properties of this mix are the following: Green strength, 1.28 psi; AFS green permeability, 68; baked permeability, 63; gas content, 8.00 cu cm per gram; dry strength, 581 psi (2 hours at 392° F) and 499 psi (1¼ hours at 392° F).

Mold and Core Coatings—Molds and cores are sprayed with various washes, particularly when they contain chills. A slurry of 85 per cent Terracote and 15 per cent plumbago mixed with water can be sprayed effectively. This treatment must be applied to the mold before it is skin-dried by gas torches. The same slurry also is used on the cores bonded with core oil. Drying is accomplished by subsequent baking in a core oven.

For sodium silicate-bonded cores it is necessary to use a medium which will evaporate quickly. A mixture of talc and red iron oxide in isopropyl alcohol has been found suitable.

CYLINDER HEAD CASTING

Pattern Equipment — When the pattern equipment for a complicated casting such as a cylinder head is designed, it is essential that the pattern shop and the foundry work closely together. Important details such as the location of water jacket joints can be decided on to give maximum support to the cores and permit maximum-diameter vents to be used without reducing any of the critical dimensional locations.

In the choice of pattern material,

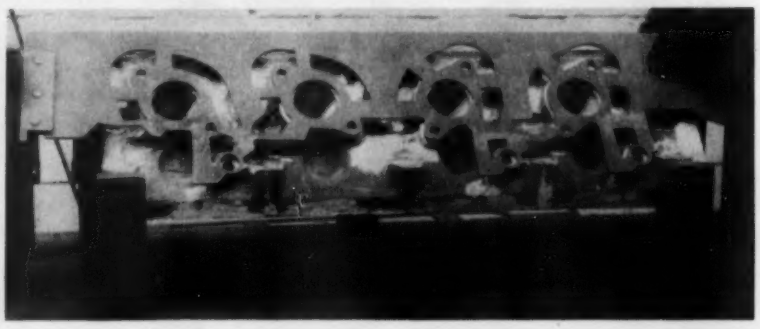


Fig. 8—Dimensional accuracy is checked in a gaging fixture

Fig. 9—A general view of the foundry area for producing the crankcase mold

factors to be taken into account include the possibility of modifications to design and, by automobile industry standards, the relatively small production quantities involved. The pattern in this instance was mounted on machined aluminum plates and constructed from mahogany, with all important faces metallized.

A set of mahogany coreboxes was produced so that any difficulties encountered in the initial stages of production could be corrected by redesign before a production set of aluminum coreboxes was made. Aluminum was chosen as a suitable material for this purpose because it gives reasonable wearing properties in conjunction with lightness in handling. This decision proved sound in the light of subsequent developments, for the aluminum equipment has maintained standards of accuracy and quality required.

Coremaking—A total of 23 cores is used to produce a cylinder head casting. Of these, the two twin pipe cores and the four single exhaust cores are made from the sodium silicate mix, the remaining being manufactured from the core oil mix.

The most intricate and delicate cores are those used to produce the water jacket. These are reinforced with 1/16 and 1/8-in. diam wires, and dryers are used for support to maintain accuracy during baking. During inspection, cores are handled in a light wooden frame which also serves as a jig from which the main dimensional points can be checked.

Remaining cores are subjected to similar inspection and, if necessary, corrected to size in a checking fixture. The subassembly of the minor insert cores takes place in the core shop so that they can be returned to the baking oven to insure adequate drying of the core adhesives.

Molding—Molds are produced in cast aluminum flasks measuring 16 x 28 in. The drag is 8 in. deep and is produced on a jolt-squeeze roll-over molding machine. The cope is 5 in. deep and is produced on a jolt-squeeze straight pattern draw molding machine.

The production plant reduces handling to a minimum. It is a small, self-contained layout, extremely flexible to allow for a very rapid changeover to other jobs of a similar nature. Fig. 1 shows the arrangement.

All molds produced from these machines are sprayed with a mold coat and skin dried before use. The drag is passed under a special gas-fired hood dryer, the cope being dried by hand. Three operators are required to assemble the cores and connect the venting system prior to closing the mold. The sequence of coring, after the drag leaves the drying hood, is as follows:

1. A previously jigged tray core is located in position by gages.

2. A lower side core carrying the prints for the induction pipe is located.

3. The bottom-half jacket core is pasted into position and checked for depth and location in relation to cores already laid (Fig. 2).

4. The four single exhaust cores are positioned, with checks to insure that the venting is correct, then are jig located (Fig. 3).

5. The exhaust side core is lowered into position and the twin induction pipes firmly fixed by sprigs driven straight through the core and mold.

6. The top half jacket is produced in two pieces for convenience, and these are pasted into position next. The molder at the same time carefully inspects for accuracy of wall thicknesses and connection of the venting system.

7. The top half side core covering the induction pipes is positioned, and a final gage is placed on to check position of exhaust ports, induction ports, jacket top prints, and top profile of side cores.

8. Five small cover cores are placed in position to complete the assembly (Fig. 4 and 5).

The senior molder supervises the final assembly. If it is satisfactory, the mold is warmed with a gas torch before the mold is closed and poured.

Gating System — Although the runner system is not conventional because it is impossible to feed this casting at any point in the tray sec-

Fig. 10—Chills are handtucked into position to minimize danger of movement during slinging

tion, it has proved very effective.

The casting takes approximately 17 seconds to pour. The downgate measures 2 x 1¼ in. and falls onto a runner bar which blends smoothly into an effective section of 1.125 sq in. A choke is obtained by inserting two perforated steel filters with an effective area of 1.2 sq in. each.

From each runner bar, three ingates with a total effective area of 2.5 sq in. are taken directly into the feeders, which measure 8¾ x 2½ in. at the top and are approximately 4¾ in. deep.

As-cast weight is 76.5 lb and finished weight is 35 lb (Fig. 6).

Cleaning and Inspection — The casting is received complete with runner system, which is removed with a bandsaw. The casting then is rough dressed with pneumatic chisels. A visual inspection for obvious defects is carried out to prevent the waste of further labor if the casting is defective. This procedure also provides early reports for the foundry so that rapid corrective action can be taken if defects are occurring.

The casting then passes to the dewiring section, where the wires which strengthen the jacket cores are removed. Because of the large cross section of the feeders, a circular saw is used for their removal. The final cleaning operations then can be carried out with rotary files and cutters.

Cylinder head castings must be pressuretight, and this check is the first on quality that is carried out. To detect leaks, the casting is placed in a jig, all apertures are sealed (Fig. 7), and compressed air is introduced to a pressure of 25 to 30 psi while the casting is immersed in a tank of water. No impregnation is tolerated to correct leakage.

Since the jig location of castings is an essential requirement of the modern machine shop, the casting is placed in a receiving jig and, with the use of map gages for sighting, all major dimensional features can be checked and adjustment made to the location pads if necessary. It is the responsibility of the inspection department to section all scrap castings and check for internal shrinkage and other possible foundry defects in addition to dimensional accuracy (Fig. 8).

Heat Treatment—As mentioned earlier, this material is used in the heat-treated condition, the treatment being carried out in an electrically heated, pit-type furnace with forced air circulation and automatic pyrometric control.

For the solution heat treatment, the castings are placed on racks, each load being put into the furnace bodily by an overhead crane which greatly facilitates handling, particularly for the subsequent quenching.

Precipitation treatment is carried out at low temperature in a thermostatically controlled, gas-fired, muffle batch stove.

Since cylinder head and crankcase require slight variations in properties, differing treatments are used.

The cylinder head receives a solution heat treatment for 6-8 hours at 995-1013° F. It then is quenched in hot water at 176° F and receives precipitation treatment for 5 hours at 248° F, with air cooling.

Cylinder head mechanical properties are as follows: 0.1 per cent proof stress (typical), 8.5-9.5 tons per sq in. (minimum); ultimate tensile strength, 12.0 tons per sq in. (minimum); percentage elongation (on 2-in. gage length), 2.0 per cent; Brinell hardness, 70-90.

The mechanical test data are from separately sand cast D.T.D. test bars. The British Standard bar is 7 in. long by 1 in. in diam and is poured from the top, without side feeders. For testing, this bar is machined to 0.564 in. diam.

After heat treatment, the casting is immersed in a series of caustic and acid baths which serve two purposes:

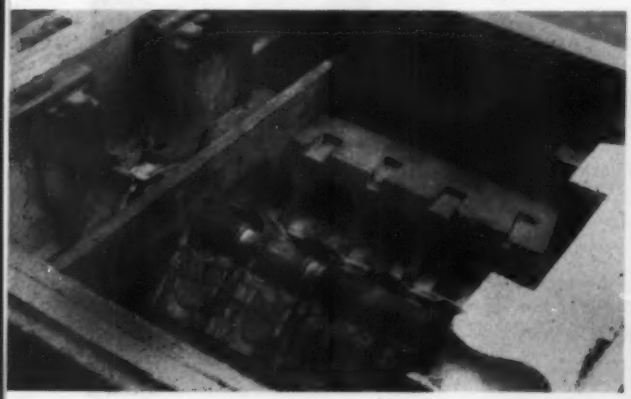
1. First, they remove small amounts of surface metal, thereby loosening any sand still remaining in the cored passages. This step is important because to make full use of the excellent thermal conductivity of aluminum, the cored water passages must be free from any adhering or trapped sand. Heat then is readily transferred through the wall of the casting to a cooling medium on the opposite surface.

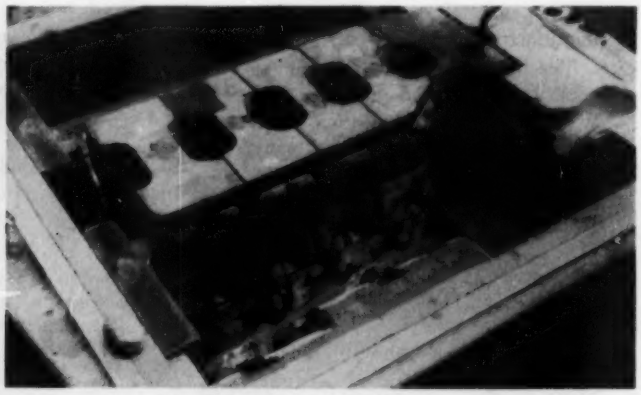
2. The chemical treatment also serves to reveal any defect such as small cracks or porosity.

After this treatment, a critical visual inspection is all that is necessary before castings are released.

CRANKCASE CASTING

Pattern Equipment — Because of the design of the crankcase, it was decided that greater speed of production could be obtained by coring the outside contour, with the secondary advantage that several alternative gating techniques easily could be tried. For maximum soundness, the sump face is cast bottom side up, the risers being placed on this face and also directly onto the bearings. This arrangement permits two-part molding and obviates the danger of cross joints since only the





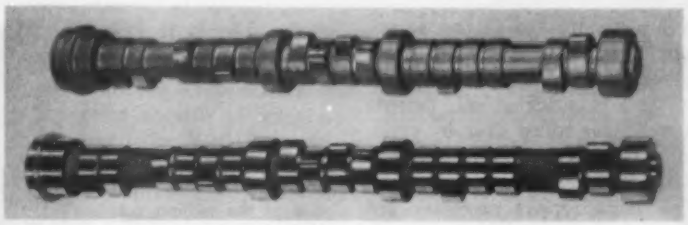
cope section produces the riser.

For the quantity to be produced, a mahogany pattern fixed to an aluminum plate and with metallized core prints was thought satisfactory.

Material for the coreboxes also is mahogany, with all faces metallized wherever wear is likely to occur. This approach provided a set of equipment which could be modified with minimum delay and cost. Such an advantage cannot be overlooked when specialized castings are being produced for a limited market. With careful supervision and inspection, the dimensional quality can be maintained, but it cannot compete with the reproducible accuracy provided by metal equipment.

Coremaking—A total of 47 cores is required to produce the crankcase. These cores are made from the core oil-bonded sand, except the tray core end of the cylinder and body cores, which are made in sodium silicate-bonded sand. All cores are produced on the bench, by hand. Where necessary, they are reinforced by shaped aluminum grids drilled and tapped to take lifting screws for easy handling. Core inspection and subassembly are carried out at the molding station for easier control of production flow and better dimensional accuracy.

Molding—Molds are produced in cast aluminum flasks—drag 36 x 36 x 21 in. and cope 36 x 36 x 7 in. They are rammed with a stationary sandslinger with hopper feed (Fig. 9). The main problem is the location of chills. To minimize the danger of movement during slinging,



Rolls Camshaft Is High-Duty Cast-Iron

TECHNICAL FEATURES of the Rolls-Royce V-8 engine include its Monikrom camshaft. The high-duty cast iron from which it is made was developed for cast camshafts which would not require quench hardening. Alloying elements including molybdenum, nickel, and chromium are used, and the composition, metallurgical control, and foundry technique are such as to give the desired mechanical and physical properties consistently.

The shaft is a short, sturdy design with four bearing journals and sixteen closely spaced cams. Metallurgical structure generally is graphite in a close-grained pearlitic matrix. This gives excellent load-carrying capacity and self-lubricating and oil-retaining properties to the journals and thrust faces. Good machinability also is a characteristic of this structure.

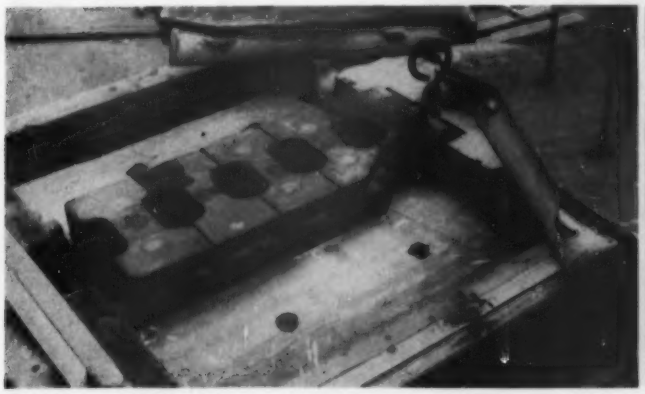
Cam noses and the upper flanks of the cams are given a structure more suitable to their duty by local chilling during casting. The harder white iron structure thus produced possesses the necessary load-carrying and fatigue and wear-resisting properties required. In addition, there is a gradual merge into the softer pearlitic gray iron. Thus there is no sharp line of demarcation which could be a source of mechanical weakness, and locked-in stresses in the cam noses are at a minimum. The cams are machinable only by grinding, and stock to be removed is held to a minimum.

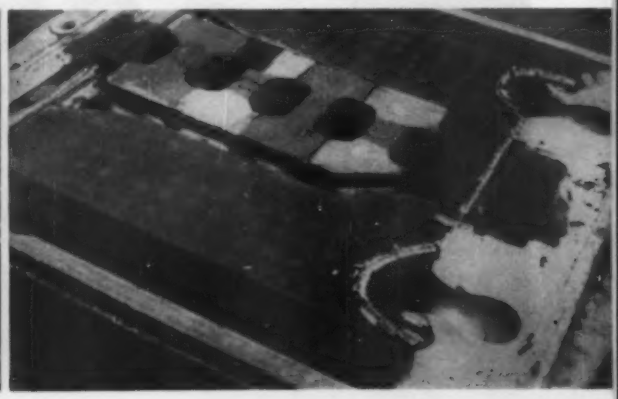
In common with other cast irons, Monikrom has advantageous damping characteristics.

The accompanying illustration shows the shaft in the as-cast condition and after machining. Sturdy design, closeness of cams, and minimum stock removal are notable features. The first journal gives endwise location in the engine and functions as a hub to the driving sprocket.

Monikrom is the registered trademark for camshafts produced exclusively by the Midland Motor Cylinder Co. Ltd., Smethwick, England.

Fig. 11—Tray core being checked for depth. Fig. 12—Timing end core is lowered into place. Fig. 13—Final positioning of side core. Fig. 14—The mold ready for closing. The stages are checked dimensionally with thickness pieces and templates





they are handtucked in precise positions (Fig. 10). After the mold has been completely rammed, surplus sand is strickled off, pattern and mold are rolled over by crane onto a sand bed, and the pattern is withdrawn.

Any mold repairs necessary are performed, and an examination is made to check chill positions, core sets, and loosely rammed areas which could be carried away by the flow of molten metal.

Mold wash is sprayed on, and the mold is skin-dried with a gas torch to provide firm core seatings and to lessen the risk of blowholes from the heavy cylinder face chills.

As stated previously, assembly of the numerous small cores takes place adjacent to the molding section. Their position is checked by templates to maintain proper wall thicknesses, and each core is torched to dry off the adhesive used.

The sequence of core assembly is as follows:

1. Small elbow pipe is pasted in position.
2. Tray core is lowered into position and set to depth gage. This core is checked outside the mold for accuracy of the camshaft bearing (Fig. 11).
3. Rear end core lowered into position.
4. The four body cores are positioned, starting from the timing end.
5. Small cover core forming pump attachment boss is inserted.
6. For ease of assembly, the side cores are split into three slab sections. The lowest side core is placed in position; this carries the water rail prints and a runner bar. Sequence of assembly is identical on each side of the job.
7. The water rail core is placed it its prints, two in the side core and one in the mold. From the latter, the air vent is taken to atmosphere.
8. The lower end core, which covers the water rail print in the mold, is set in position. This core also contains part of the runner system.
9. The timing end core is lowered into place (Fig. 12).
10. The remaining two side slab cores are located (Fig. 13).
11. The center inset core is positioned at the rear end.

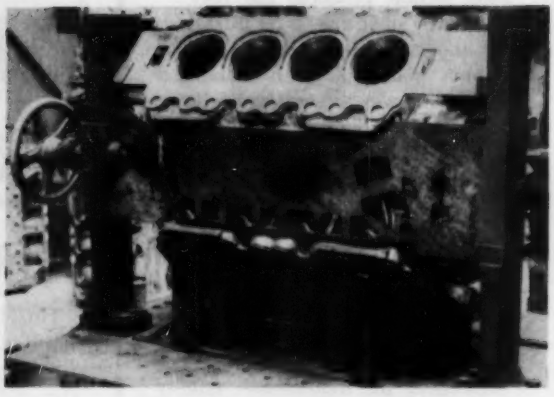


Fig. 16—Casting on the jigging fixture showing one of the milling cutters used to size the location pads.

The stages are checked dimensionally with thickness pieces and templates. The final check on the position of the body cores, which contain the crankshaft bearings, is with a template located in the pin centers of the flask parts which serve as a datum for separate checking gages. The runner is sealed with a mixture of French chalk and machine oil before closing (Fig. 14).

Finally, to reduce the bulk of metal in the open block riser, rectangular core sections are placed on top of the body cores.

Gating System—Several runner systems have been tried, but the one in current use has given extremely consistent results.

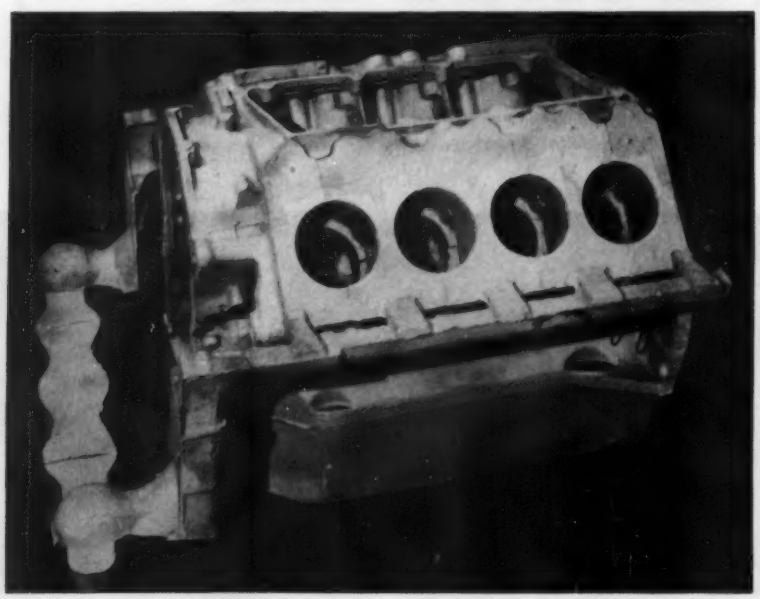
Metal is poured into a large downgate of 4.5 sq in. and falls onto a runner bar which contains an intermediate choke of perforated steel sheet filters with an effective area of 3.0 sq in. The runner area is increased to 3.2 sq in. before the metal drops down two vertical channels of generous cross-section.

These connect with the runner bar formed in the lower face of the first side cores, each bar having a cross section of 1.4 sq in. The five ingates supplied from each bar have an effective area of 2.75 sq in. The large riser is extremely heavy—25 x 12½ x 5¼ in. deep—but it insures an ample supply of hot feed metal, which is desirable in such castings.

The as-cast weight of 238 lb is reduced to 112 lb after finishing (Fig. 15).

Cleaning and Inspection—To free the casting from the molding box,

Fig. 15—Runner system of the crankcase casting. Removal of the gating and riser plus finishing reduces the as-cast weight of 238 lb to 112 lb



it is necessary first of all to break away part of the runner system. Then wires, chills, and any adhering sand are removed. The cleaning and finishing of this casting follows the general pattern for all of the heavier components produced in the foundry.

The two runner sections which remain are cut off when the large feeder is removed on a vertical bandsaw. The risers which are directly onto the bearings are removed on the same machine. At that point, the casting is in a suitable condition for the first visual inspection.

Flash and surplus material are removed with conventional pneumatic and electrical hand tools before the casting is passed to the pressure-test section.

The areas of major importance which require pressure testing are the cylinder bores and the adjacent water rail passage, which are checked at 30 psi in two independent tests.

The dimensional checking fixture is elaborate, as can be seen from Fig. 16. The locations are milled for greater accuracy, and adjustable jacks are incorporated to enable the operator to obtain finer adjustments. Major dimensional features, such as the position of the crankshaft bearings, are set to the most advantageous position before the location pads are adjusted by milling.

The casting is heat treated and subjected to the chemical treatment previously described for the cylinder head before it is released for shipment.

Heat Treatment—The crankcase heat treatment consists of solution heat treatment for 8-10 hours at 995-1013° F. The casting then is quenched by immersion in oil at 140-176° F. Precipitation treatment is for 5 hours at 248° F, with air cooling.

Mechanical properties of the crankcase are as follows: 0.1 per cent proof stress (typical), 11 tons per sq in. (minimum); ultimate tensile strength 13 tons per sq in. (minimum); percentage elongation (on 2-in. gage length), 1.5 per cent; Brinell hardness, 80-100.

Quality — The maintenance of quality is regarded as of prime importance by the foundry, and every possible effort is made to control quality during manufacture.

The metallurgical specification is controlled by daily routine chemical analysis of melts and incoming materials. Test bars are manufactured and heat treated with the castings to check the mechanical properties of the material and the accuracy of heat treatment. Each casting is Brinell tested as an added check to insure correct metallurgical condition.

Foundry defects which can escape visual examination are checked and controlled at regular intervals by means of x-ray inspection. This system reduces machine shop rejects to a very low percentage. Each casting is serial numbered to trace the history of a component should it be rejected by the customer.

As previously stated, the chemical bath treatment provides, in addition to its prime function, an added control for the detection of cracks which may have occurred during heat treatment or in subsequent handling of the castings.

Conclusions—The main requirements for the successful manufacture of intricate castings such as the crankcase and cylinder head are the following:

1. First-class pattern equipment used in conjunction with modern production techniques in the hands of skilled operators.

2. Suitable material control by an experienced team of laboratory and foundry technicians.

3. Conscientious and intelligent supervision at each stage in manufacture and inspection.

Production must be backed by efficient service departments, each having an important part to play in maintaining continuity. Success in manufacture also is a measure of the efficiency of the initial planning and pattern layout department.

Acknowledgment—The author acknowledges the courtesy of Rolls-Royce Ltd. in allowing him to reproduce illustrations of their products. He also thanks the Birmingham Aluminum Casting (1903) Co. Ltd. for permission to reveal their manufacturing processes and the staff of the company for their assistance.

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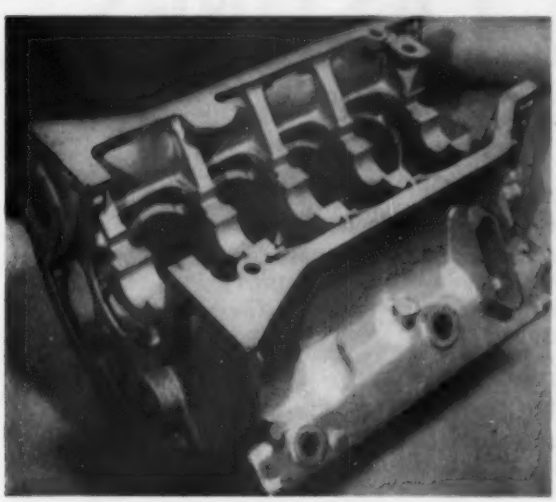
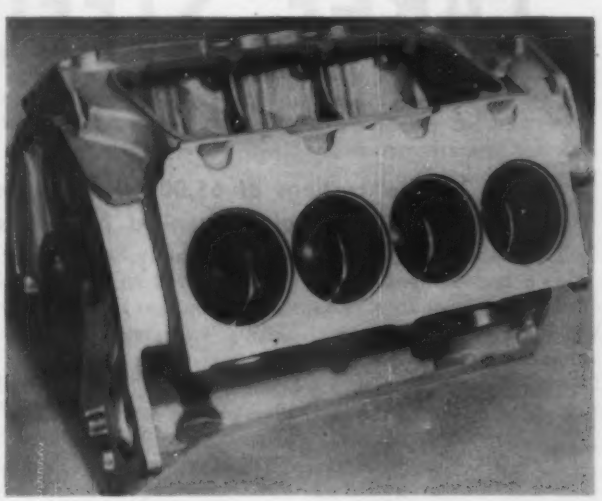
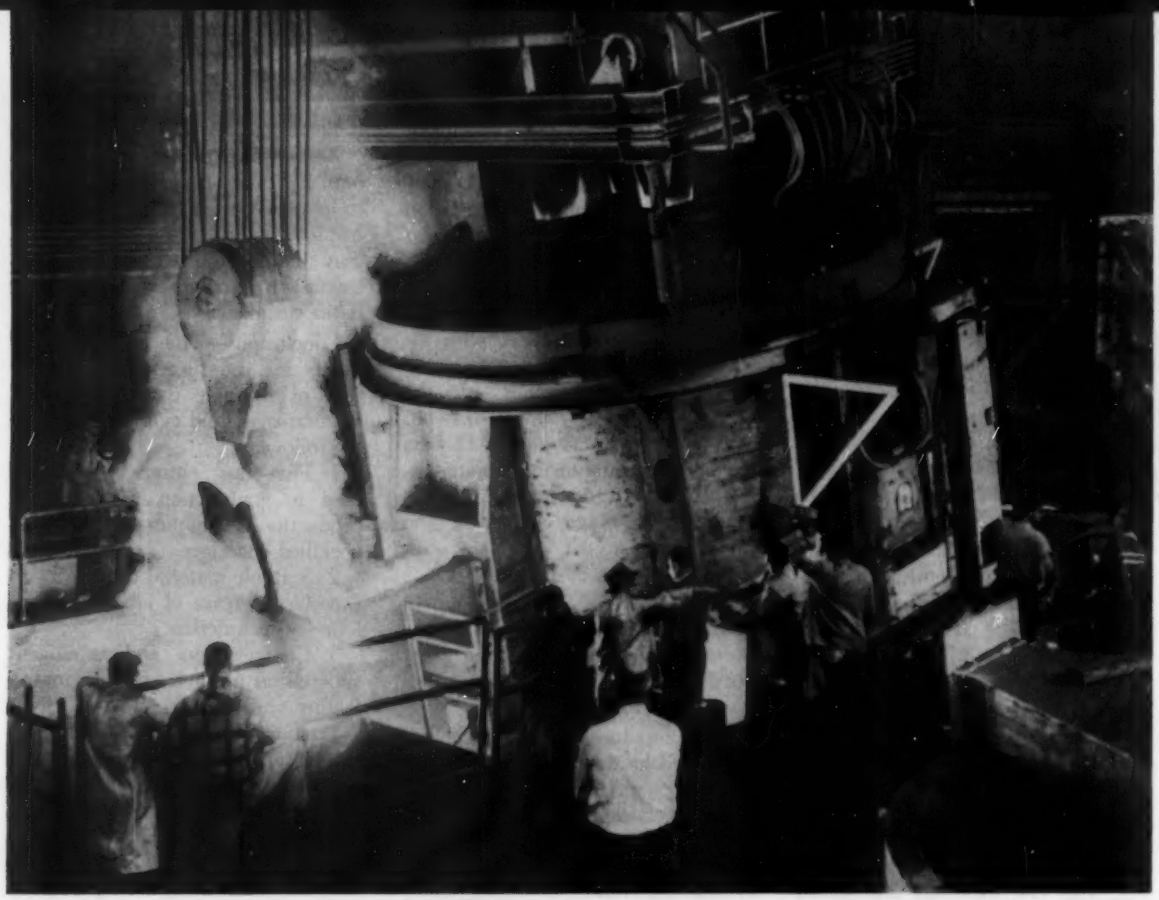
Fig. 17 and 18—Two views of finished crankcase casting







Steel is tapped from the new 100-ton capacity, basic lined arc furnace

New Foundry Specializes in

LARGE STEEL CASTINGS

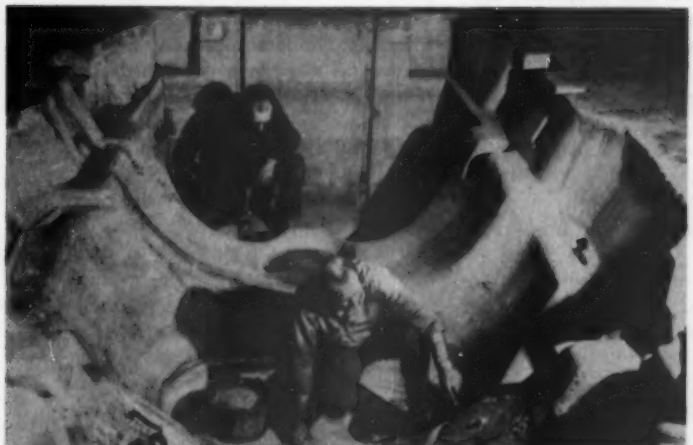
Steel castings of 65,000 lb are being poured at this new foundry. Molten metal is supplied by a basic-lined, electric arc furnace of 100-ton holding capacity, equipped with an induction stirrer

By ROBERT H. HERRMANN
Associate Editor

● FIRST HEAT of metal at General Electric Co.'s new steel and iron foundry in Schenectady, N. Y., was poured last Sept. 14. That was about four months ahead of schedule. A former iron foundry has been converted for making steel as well as gray iron castings weighing up to 100,000 lb. This has been done to meet greatly expanded needs for large steel castings.

To date, all production in the new operation has been in steam turbine shells. Those castings are of low-alloy steel (1.0 Cr and 1.0 Mo) and range in weight from 35,000 to 65,000 lb as shipped. A variety of other large iron and steel castings is planned.

Molten steel is supplied by a new basic-lined, electric arc furnace rated at 100 tons holding capacity. The furnace is equipped with an induction stirrer, and is the third furnace operated by GE to be so equipped. The other two furnaces are in the company's older steel foundry in Schenectady. Stirrers also are being installed on an existing 12-ton electric furnace and on a new 25-ton electric furnace at the company's foundry in Everett, Mass.



Molders put the finishing touches on this large mold prior to drying it with portable equipment

Melting Procedure—The new furnace at Schenectady is charged with 60 per cent foundry returns and 40 per cent purchased plate scrap. Normally the foundry returns consist of 20 to 25 per cent chips from the company's machine shop.

Sufficient carbon in the form of broken electrodes or graphite is added to the charge to attain a charge analysis of 0.4 per cent carbon. Also 100 lb lime per ton of melt is added as the charge melts. When the charge is molten, a preliminary metal analysis is made. Fluorspar and lime are added and after a short time the furnace is tilted, and about half the slag is removed at the slag door. With the furnace returned to vertical position the magnetic field generated by the induction stirrer is reversed, causing metal flow in the furnace to be directed up at the spout in preparation for pouring. The remaining slag is replenished with new additions of fluorspar and lime.

The bath is subjected to an oxygen boil with a 1-in.-diam lance for 7 to 20 minutes to reduce carbon content to 0.13-0.15 per cent. Carbon analyses are taken during the boil to determine length of treatment. After the boil, additions of 0.15 per cent manganese and 0.25 per cent silicon are made to quiet the heat. Then a metal sample is analyzed, and elements are adjusted to meet specifications.

Graphite and 90 per cent ferrosilicon are added as the melt reaches pouring temperature, to recover metallic elements lost in the slag. The temperature of the melt is taken with an immersion pyrometer and adjustments made as the final metal analysis is performed and chemistry adjusted. The melt is tapped at a temperature of 2920° F.

Induction Stirring—An induction stirrer is a water-cooled coil resembling a segment of the stator of a large two-phase induction motor. The stirrer coil is suspended about 1 in. below the refractory-lined stainless steel bottom of the furnace. A two-phase generator driven by an induction motor supplies low-frequency, alternating currents to excite the two-phase winding in the stirrer coil. The traveling magnetic field induces eddy currents in the molten metal bath. The magnetic field associated with these eddy currents reacts with the excitation field, thus creating a stirring force which moves molten metal in the furnace across the hearth bottom and upward and sideward.

The moving magnetic field in the stirrer can be reversed to direct metal flow in the furnace up at the spout for pouring or up at the slag door for slag-off operations.

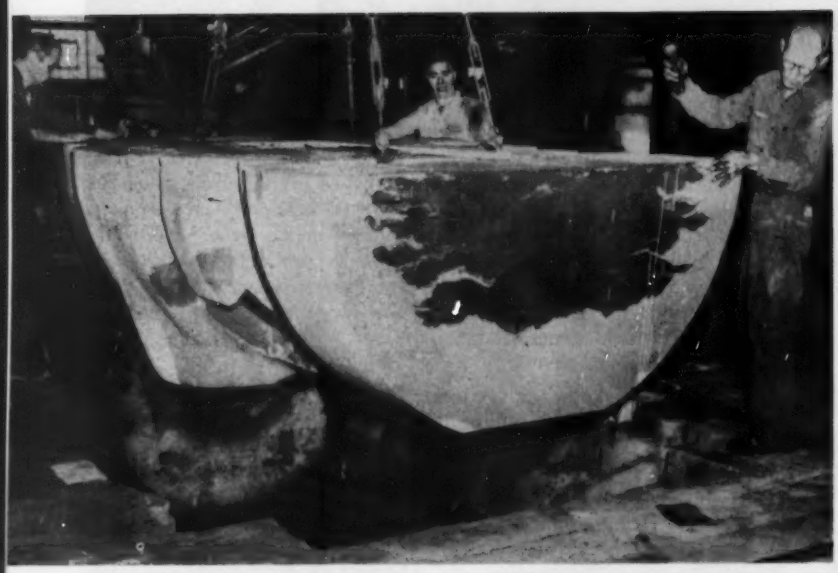
After three years' experience with the use of induction stirrers on arc furnaces, GE reports a number of benefits. Less difficulty has been encountered with burn-in, hot tears, folds, and laps in castings. Also, mechanical properties of the cast metal are better than those obtained with conventional practice. Tests indicate that the steel has low hydrogen, nitrogen, oxygen, and nonmetallic solids content.

Close control can be maintained over metal chemistry. Sulfur can be reduced to 0.01 or less, and impurities such as phosphorus and silicates can be removed with little or no loss of metal. Chemical stratification is minimized, and sample analyses are representative of the entire heat.

The close chemistry control permits holding near the bottom level of the ranges for alloy additions, effecting economies in alloy additions. Melt temperature also can be controlled closely, and processing of the heats is faster than with conventional practice.

The use of induction stirring facilitates the economical use of chips. A couple of satisfactory melts have been prepared with charges of 100 per cent chips. Additional economy has been achieved by the use of chips containing molybdenum, thus saving the cost of a separate molybdenum addition.

On the basis of experience to date,



Workmen guide large core as crane operator lowers it carefully into mold in which a cast shell is produced for a steam turbine generator

company metallurgists believe that economies from benefits attained will permit amortizing the cost of the stirrer on the new furnace in about four years.

Molding Practice — Molds are made in 14 x 20-ft welded steel flasks, 30 in. deep. Usually three sections are used, and occasionally a 15-in. section is added for making the large size turbine shells. Flasks are held together by steel C-clamps and wedges tack welded in place. Pattern equipment is of wood mounted on a board and consists of a drag pattern only. The patterns are made of interchangeable segments for making different size turbine shells. The cope contains only the risering and top gating systems formed by a group of cores assembled on a plate.

In molding, a flask section is set on the pattern board and workers use pneumatic tools to ram a 3 to 4-in. layer of facing sand against the pattern to the height of the flask segment. Backing sand is rammed by a slinger. The next flask section is set in place and the ramming process is repeated. This sequence continues until the mold is rammed completely. Runner tiles for the bottom gating system are set in place as molding progresses.

The facing sand mix consists of AFS fineness 55-60 New Jersey silica sand with 2 per cent western bentonite, 2 per cent core oil, 20 per cent silica flour, and 8 per cent moisture. Sand mix properties are 5-6 psi green strength, 20-30 permeability, and 300 psi dry compression strength.

Backing sand is made up of 50 per cent AFS 30 fine gravel and 50 per cent shakeout sand salvaged from the water-sand blast castings cleaning room, plus 18 per cent clay. Moisture in this mix is held at 5 per cent.

A bridge crane is used to roll a rammed mold over and draw the pattern. A bridge crane also sets the mold in a pit. Placing the mold in a pit facilitates subsequent operations associated with pouring the mold. The mold cavity is coated with silica wash.

Portable, gas-fired heaters dry the mold. Air at 480° F is directed into the mold cavity by flexible ducts inserted in the sprues. Riser openings in the mold are covered loosely with tar paper to slow air flow through the mold cavity and thus aid drying. The mold is dried for about 28 hr.

Coremaking — Facing sand used for cores is made up of AFS fineness 55-60 New Jersey silica sand with 2 per cent western bentonite, 2 per cent core oil, 40 per cent silica flour, and 9 per cent moisture. This produces a mix having 6-8 psi green strength, 5-15 permeability, and 300 psi dry compression strength. Backing sand is the same as that used for molds.

Cores are rammed with pneumatic tools, drawn from the boxes, and coated with a zircon wash. Cores are baked in gas-fired ovens at 480° F for 24 to 48 hr, depending on size. When cores are cool, workers rub the wash off at small areas where hot tears are likely to occur. According to GE foundry engineers, the resulting roughened surface creates points of low stress concentration, thus eliminating a high-stress point and reducing the likelihood of a hot tear. Molders rub small areas of the mold to achieve the same results.

Cores are set in the dried mold, and the core assembly forming the top gating and risering systems is set on top of the mold. Dried sand pouring basins are set in place and the portable dryer system replaced. The cored mold is heated with air at 300° F for a minimum of 10 hr immediately prior to pouring.

Pouring—Two ladles are used to pour these large molds. Each has two independently-controlled, bottom-pour nozzles. When bridge crane operators have positioned the ladles over two sets of double pouring basins, ladle operators open one nozzle on each ladle. The first metal flows through the bottom gates at about 2800° F. When the mold is about three-fourths filled, the second nozzles are opened and the other two closed. The second metal flows through the top gates. Pouring is finished by moving one of the ladles over a fourth sprue, which feeds the risering system.

The riser is an open, flattened ring, and as soon as it is full of metal, workers shovel exothermic material and rice hulls over it to keep the metal fluid and prolong its ability to feed the casting.

Cleaning and Heat Treating—Poured molds are allowed to cool for six to eight days before the castings are broken out. A crane first removes the plate carrying the top gating and risering core assembly. Then the top flask segment is lifted off, and the mold material is dug out down to trunnions which have been cast onto the casting.

Workers loop chains over the trunnions and the casting is lifted by bridge crane to the car of a bulk-

head electric oven for heat treatment. The casting is at 575 to 1110° F as it enters the oven. There the temperature is brought to 1300° F and held for 18 hr. The total cycle takes 48 to 72 hr. When the casting is removed from the oven it cools in air to room temperature, then is moved into a water-sand blast room for cleaning. Gating and risering metal is cut off with oxyacetylene torches.

The casting next is annealed at about 1745° F and cooled in the furnace. Total cycle is about five days. After annealing, the casting is shot blasted and cleaned with chipping tools and grinders. Metal hardness is checked to verify that it is below the 200 Brinell maximum specified.

The casting is transported to GE's large steam turbine-generator department where it is finished and the turbine partly assembled. In this condition it is returned to the foundry for normalizing at 1900° F for 8 hr, air quenching with fans, then drawing at 1290° F for about 20 hr. Following this, the partial assembly is returned to the turbine department for completion.

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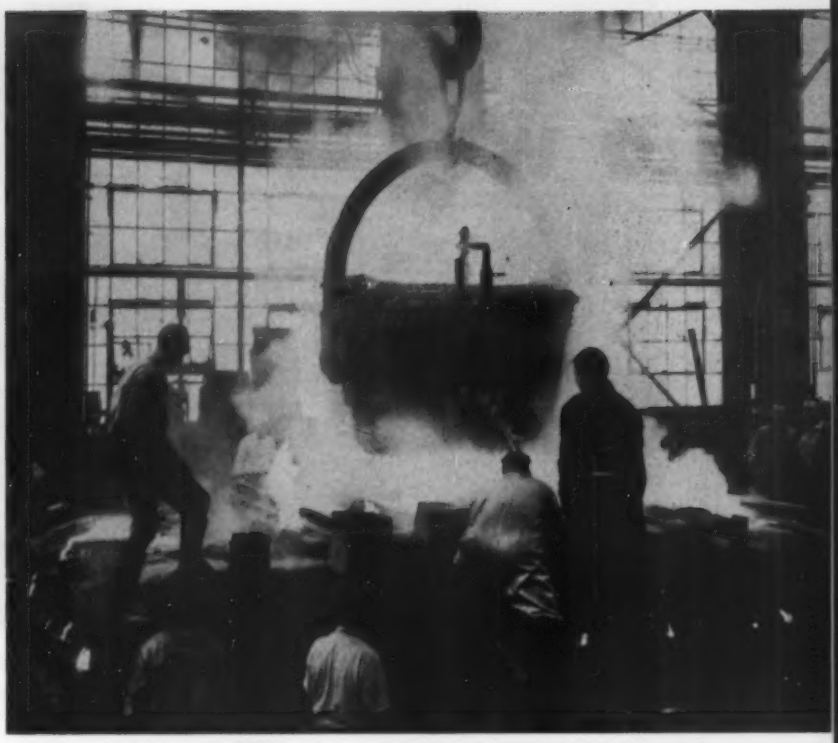

Pouring a large mold. After they have been poured, molds are allowed to cool for six to eight days before the castings are broken out

The riser is burned off by using an oxyacetylene torch. This is done after the steel casting has undergone heat treatment and air cooling

HOW TO CUT NOISE in the Cleaning Room

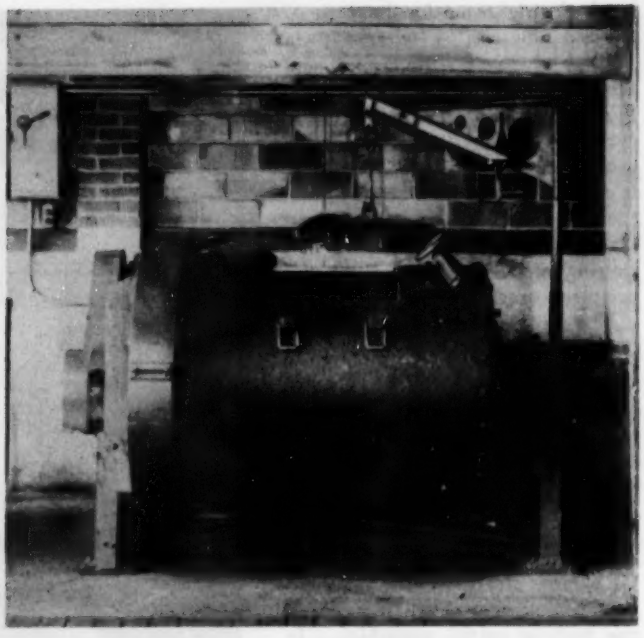

Fig. 1—Tumbling barrel with footings applied to stop transmission of vibration through the floor

It has been shown that a foundry can cut the general noise level in a cleaning room at a reasonable cost. Here is a detailed presentation of the steps involved in reducing noise at one foundry

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● FOR A PERIOD of approximately a year and a half, beginning in 1953, a study was made of noise in the foundry cleaning room of our LaCrosse Works as a step in reduction of the general noise level.

Studies by Walter Scholz of our West Allis Safety Services Dept., made in 1952, indicated decibel ratings of noise levels up to 106-108 db at a time when our cleaning room was not working nearly at capacity. Another study by Scholz in March, 1953, when production again was below average, indicated levels ranging to 104 db, with no readings falling below 94. In both instances no analysis was made of noise frequency.

Tests conducted by LaCrosse Works personnel during late 1953 and early 1954 repeatedly confirmed exposures to noise levels well above 100 db. The varied sources of noises in a foundry cleaning room make it all but impossible to duplicate test conditions exactly each time a check is made; nevertheless we think it significant that exposures ranging from a minimum of 94 db to a high of 115 db were obtained by everyone sampling the room.

Tests conducted by the writer on Nov. 25, 1953, showed noise levels of 93 to 110 db. For the first time an analysis of the noise was made using a general radio octave band analyzer. Noise levels in the range of 600 to 2400 cycles per second were recorded that were constantly above 95 db almost everywhere in the cleaning room. Exposure to the hearing zone of the majority of employees averaged 96 db in these frequencies. Two tumbling barrel operators and two men who serviced airless blast barrels were subject to exposures running to 102 db in the high frequencies. These exposures prevailed about five of the eight hours of the working day.

Over-all noise levels during these tests ranged from 94 to 106 db, with intermittent noises of 112 db noted from time to time during the tests. We were convinced that noise levels found in the cleaning room constituted a hazard to hearing according to accepted standards.

The cleaning room is 40 x 70 ft, with the roof coming to a peak 30 ft over the center of the building. The walls are brick and tile. A cement floor covers most of the area, with some brick and wood blocks in the center. The ceiling is asbestos tile, block type, and has one skylight about the width of the room situated in the center of the roof.

One doorway, leading into the main foundry room from the center of the room, is 12 ft wide. Girders and supports, all of steel, form a network overhead beginning about 12 ft above the floor. Windows cover an area on east and west

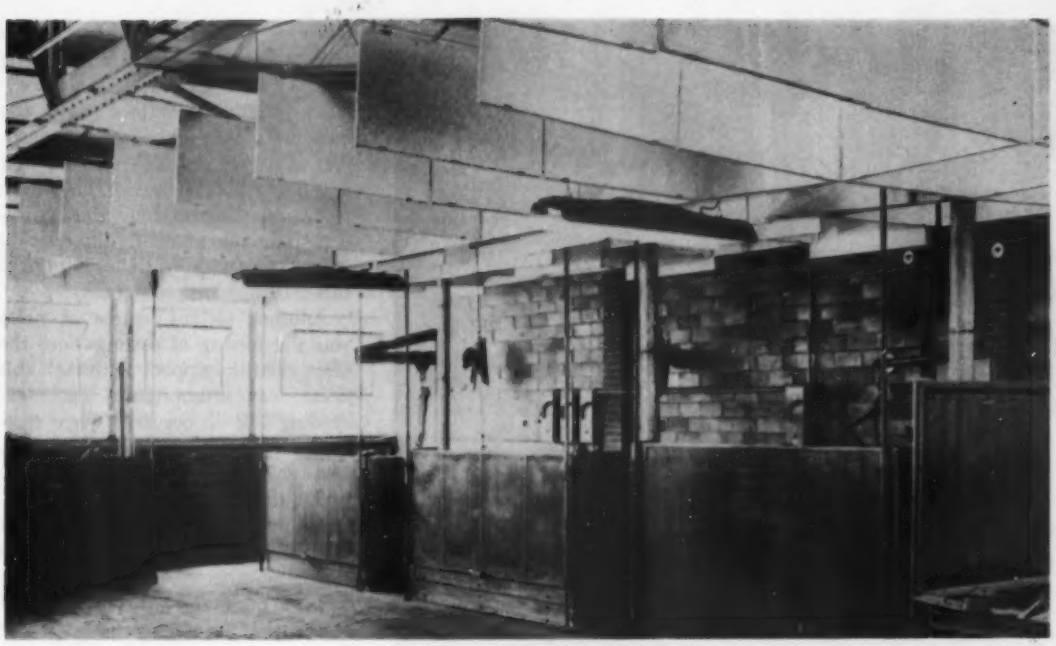


Fig. 2—Barriers erected by tumbling barrels. A barrier at the extreme right prevents noise from channeling behind the barriers out into the room

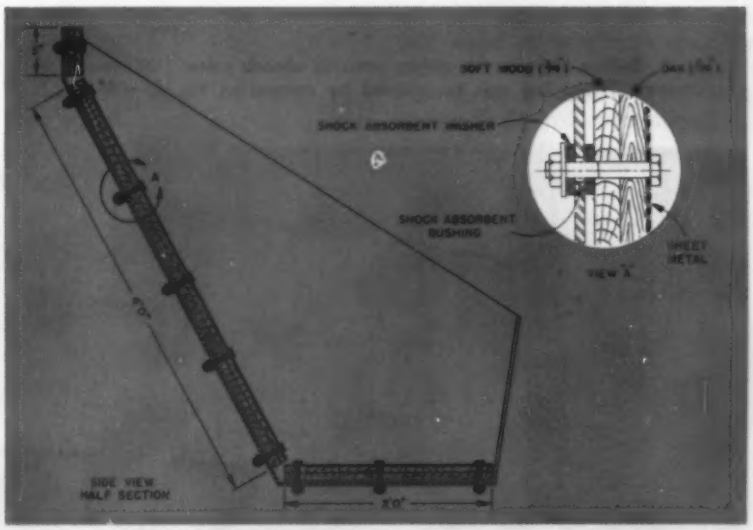


Fig. 3—This sketch illustrates the construction of the dampener applied to blast cleaner hoppers

sides of 8 x 40 ft beginning 4 ft from the floor. One double door leading to the outside is at the southeast corner of the room, and a single door to the outside is on the northeast corner.

Sixteen to twenty men usually are engaged in airless blast cleaning, tumbling, grinding, and other cleaning room operations. Two small air grinders are used intermittently and some swing grinding is done occasionally.

Of the four tumbling barrels, two usually are in use for the first three hours in the morning. Occasionally three barrels are running at the same time and sometimes the fourth barrel is used. Most of the time two barrels are operated. One airless blast unit is used steadily all morning and intermittently during the afternoon. A second machine is primarily a standby unit. The room also has four double stand grinders equipped with 20-in.-diam wheels. Grinding by at least five to eight men is a steady morning job.

Exposure to noise in high levels has begun at 7 a.m. and usually lasts until after noon, or an exposure of about six hours a day for the majority of cleaning room employees. Several men work in the cleaning room during pouring in the afternoon and are subject to noise levels above 95 db for the full eight-hour period.

Studies of noise sources and noise transmission paths were made over a period of several months. Identification of noise sources and their effects on the over-all loudness were tabulated and the necessary abatement steps became clear as the studies progressed.

No. 1 source of noise was the four tumbling barrels. This noise was being transmitted through a reinforced cement apron on which the barrels stood, and isolation of these barrels by footing changes was indicated. Several types of isolators, mounts, and various types of shock absorbing materials were investigated. Best results were obtained with a material called Fabreeka, which is composed of layers of tightly twisted, closely woven lightweight, cotton duck of which each

Fig. 4—Blast cleaner hopper with the dampener inserted and a coating of sheet metal deadener applied to the outside of the hopper

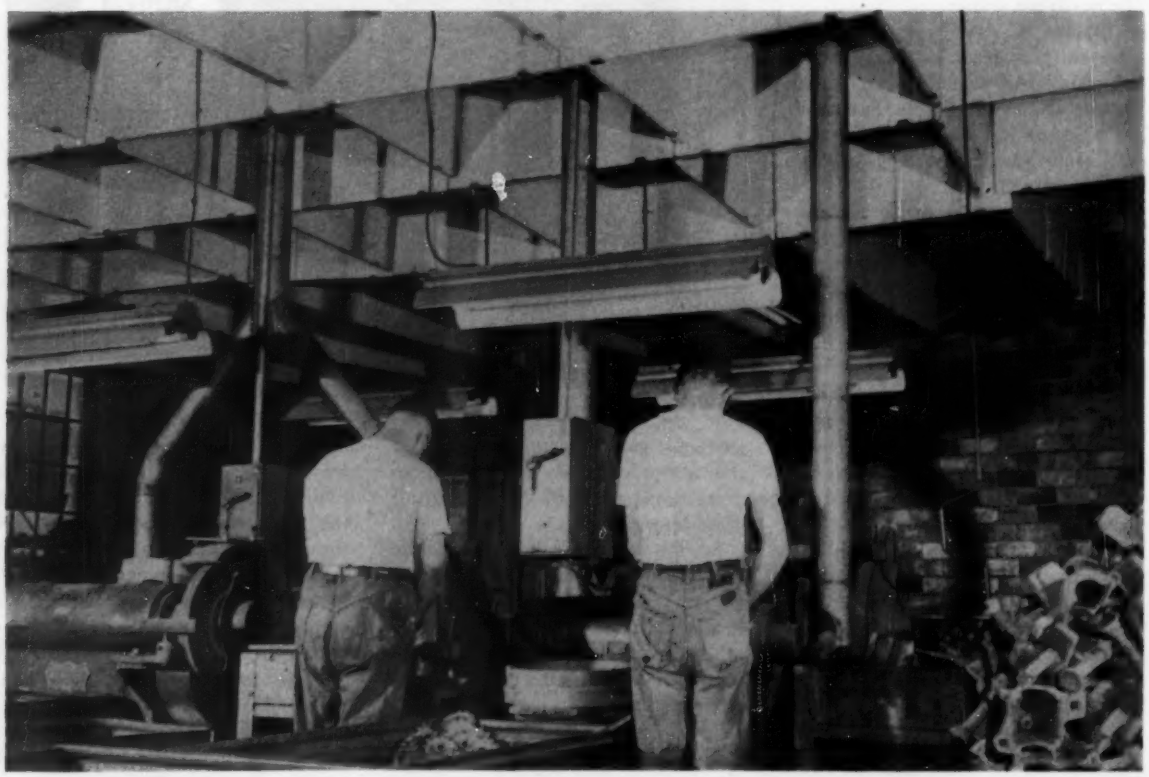
Fig. 5—Baffles hung in the ceiling area to absorb noise. Differences in patterns of hanging can be noticed by comparing Fig. 2 with Fig. 5

layer is thoroughly impregnated with a special rubber of neoprene compound vulcanized together.

In isolating the footing of the barrels we used grommets and washers on the nuts and bolts as well as $\frac{5}{8}$-in. thick Fabreeka. We were pleasantly surprised by the significant reduction made in the over-all noise level with the elimination of this transmission problem.

Another serious source of noise was the tossing of castings into the blast cleaner hoppers. Although this noise was intermittent, levels exceeding 112 db occurred when castings hit the bottom of the hopper, and seldom were below 100 db while the hopper was being filled. The high frequency and intensity of this noise caused more complaints than any other cleaning room noise.

This problem was corrected by installation of dampeners of the type shown in Fig. 3. Reductions in loudness across the frequency band averaged slightly more than 19 db, with best results in the higher frequency bands. Cost of the dampener installed in the hoppers was low, about $150 each. After some $3\frac{1}{2}$ years of hard use they present no major maintenance problem.



Cost Details of Noise Control Program

	Material	Works Expense Burden	Labor	Total
Isolate footings of four tumbling barrels...	$120.00	$91.00	$140.00	$361.00
Install noise mufflers in two blast machine hoppers	86.00	84.50	130.00	300.00
Treat trays and barrels and hoppers with sound deadener	150.00	70.80	100.00	320.80
Install four sound barriers	60.00	30.00	44.00	134.00
Apply overhead noise stop baffles	1073.55	149.00	230.00	1453.05
Change tool rests and apply sound-absorbent washers to wheels	14.12	10.70	16.85	41.87
TOTAL	$1513.67	$436.70	$660.85	$2611.22

Throwing castings into steel trays also contributed to the over-all high sound level of the cleaning room. To help cut this noise, a rubber-base, sheet metal deadener was applied to sides and bottoms of the trays. First a ⅛-in. coating similar to that applied to automobiles was used; although it was an improvement, a ¼-in. coat applied in two applications proved more effective. A 48-hour drying time between coats provided a hard surface that resists wear. Considerable reduction in both loudness and frequency resulted.

Test trays to which the deadener was applied by an outside body shop cost about $3 a tray. By purchasing our own spraying equipment and buying the material direct, the cost was cut to slightly over $1 a tray.

The bottoms of all trays into which castings are dropped from hoppers are covered with 2 in. of sand. This also contributes to noise reduction.

Treatment of the outside of tumbling barrels with a ¼-in. coating of the same rubber-base deadener as used on trays also resulted in a small but noticeable improvement by reducing the frequency of the noise slightly. The outsides of the blast unit hoppers also were treated, and finally all sheet metal guards were removed, sprayed with deadener and replaced, using additional stiffeners where vibration was indicated. All these steps, while small, actually reduced the over-all sound level in the room about 2 db.

A further step with tumbling barrels was intended to direct the transmission path of noise from the barrels away from the hearing zone of persons working in the area. Costs were obtained from commercial sources for installation of sound barriers in front or around the barrels. Prices quoted were $5 to $12 a sq ft. None of the suppliers could give us satisfactory assurance of what the installation would accomplish; one firm recommended complete isolation of all barrels on a floating floor at a cost of about $4500. This still would not take care of other difficulties in the room.

Using a plain wood barrier with wings tilted inward toward the barrel about 30 degrees, we found a substantial reduction in noise level, particularly in front of the machines. Checks throughout the room indicated that the path of the noise was directed upward and some energy was dissipated in the ceiling area. The noise reduction in lesser degrees was reflected throughout the room.

This installation was made using low-cost No. 3 spruce boards ¾ in. thick, 8 in. wide and attaching them to guards that were already present in front of each tumbling barrel. We also found that spraying a ⅛-in. coating of rubber-base deadener on the inside of the barrier generally added to its effectiveness. The results were an average reduction throughout the room of 3.7 db, with 4 and 5 db reduction directly in front of the barrels.

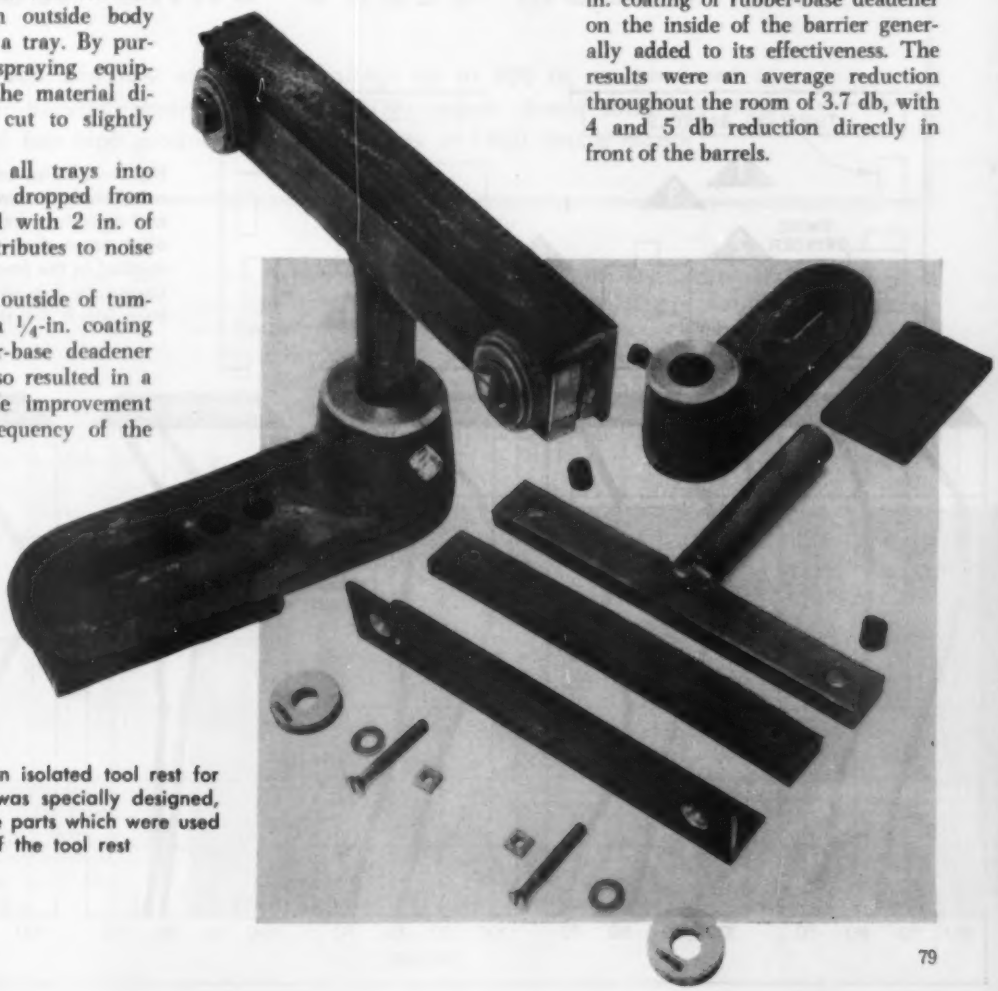


Fig. 6 and 7—An isolated tool rest for grinders, which was specially designed, is shown with the parts which were used in construction of the tool rest

Following the installations of the barriers in front of the tumbling barrels we found we still had a noise level ranging from 90 to 98 db over-all in the room. Sound absorbent material overhead was obviously the next step.

A search for absorbent materials of some kind produced about seven or eight makes and types for which comprehensive data were available. Tests were conducted on all available types of acoustic absorbents and final choice was based on performance data furnished by impartial sources, our own experience, manufacturers' data, and price. In calculating our needs we decided that an over-all reduction of 15 to 20 per cent in higher frequencies would place the noise level in a safe area. The reduction already obtained indicated we should work toward an additional average reduction of about 8 db. Actually we were 1.0 db under our estimated average, achieving a 7.0 reduction, which was entirely satisfactory.

In applying the absorption materials, our hanging pattern was determined by the location and intensity of the noise source. One instance worthy of note is the concentration of baffles over grinding wheels which proved effective for everyone but the operator. A few feet away from the operator, noise levels of 87 or 88 db were found but the operator's hearing zone produced readings of 90 or 91 db. To reduce this noise level, a special tool rest (Fig. 6-7) was designed and a ⅛-in.-thick sound absorbent washer was installed between the wheel and arbor. This change caused a reduction of 2 to 3 db in over-all noise and as much as 5 db in the higher frequencies.

The above steps taken in our noise abatement program in the foundry cleaning room were accomplished in the following order:

1. Reduce vibration transmission from footings of tumbling barrels.
2. Install wood and steel mufflers in bottoms and backs of blast machine hoppers.
3. Treat all trays used in the cleaning room with sound deadener.
4. Install sound barriers at the front of the four tumbling barrels.
5. Install fiber glass sound stop baffles. These baffles to be hung on wires about eight feet above the floor in approved patterns.
6. Install tool rests and special arbor washers on grinders.

Some further steps are now completed, i.e., isolating surfaces of benches, quieting ventilation system, etc., but these moves were made only because of their experimental value. Even before these improvements, exposure in this room was considered free of hazards to hearing.

The fact that noise can be abated at a reasonable cost is indicated by the accompanying table of expenses involved in the various steps of the program.

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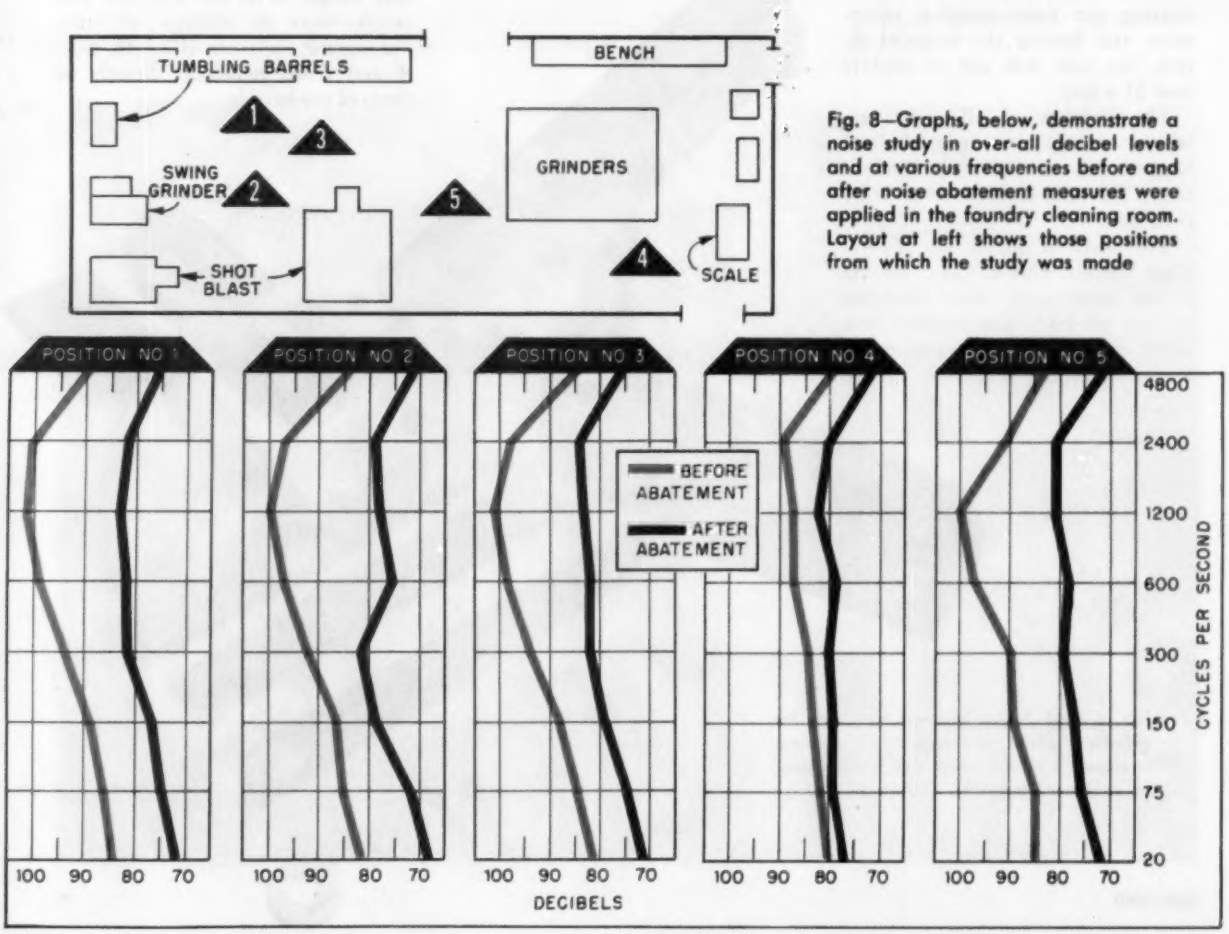


Fig. 8—Graphs, below, demonstrate a noise study in over-all decibel levels and at various frequencies before and after noise abatement measures were applied in the foundry cleaning room. Layout at left shows those positions from which the study was made

By ROBERT H. HERRMANN
Associate Editor

One man controls sand reclaiming, mixing and distribution by these pushbutton panels. The system automatically processes up to 20 tons of coated sand an hour

Makes Large Steel Castings in

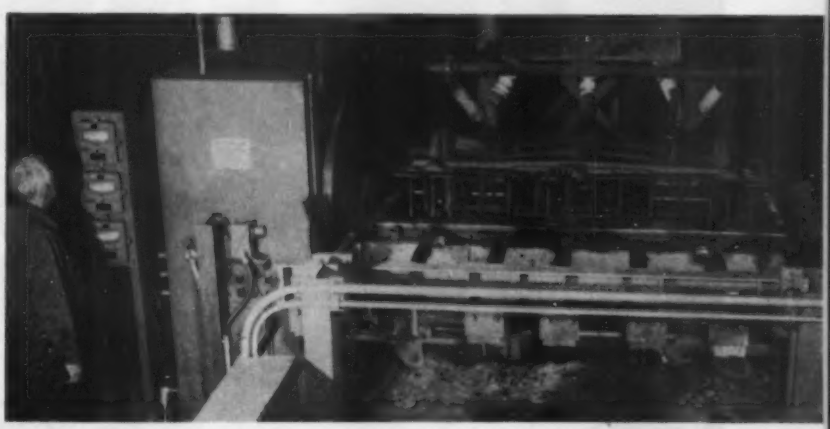
ZIRCON SAND SHELL MOLDS

Carbon and low alloy steel castings up to 300 lb are produced in resin-bonded zircon sand molds. This former green sand job shop now has high production work capacity of 1800 tons a month

● STEEL CASTINGS in the 15 to 300 lb range are being produced in resin-bonded zircon sand shell molds at the newly-equipped Indiana Harbor Works of American Steel Foundries, East Chicago, Ind. Of the 800-tons-per-month current output, 50 per cent is in low-alloy, 40 per cent in carbon, and 10 per cent in special alloy. Capacity of the foundry is rated at 1800 tons per month.

Typical castings produced include brake beams and other railroad freight car parts, tractor sprockets and rollers, industrial valve bodies, power shovel tooth points and other wear-resistant parts, and fifth wheels, which are attachment devices used to couple highway truck tractors to their trailers.

Formerly operated as a green sand molding foundry, conversion to shell molding started in January, 1959. Conversion was completed during the first quarter of 1960. The shell molding process used is tradenamed Amer-Shell and was developed at American Steel Foundries Manufacturing Research Laboratory through an extensive research program over the last ten years.



Arms of a mold removal device are ready to move under cured drag on the lift pins. Drag is removed from molding machine, rolled over, and set on a four station rotary machine

Cope is delivered automatically from molding machine and set on cored and pasted drag resting on rotary machine. Clamping is done at next station, left

It is believed the plant is the first facility completely devoted to the production of steel castings by the shell process and the only plant where such castings in the several hundred pound range are being produced commercially.

The successful casting of carbon and low-alloy steel in shell molds on a production basis is a significant foundry development. It gave impetus to the desire of ASF management to eliminate general steel foundry jobbing work and expand into high-production work.

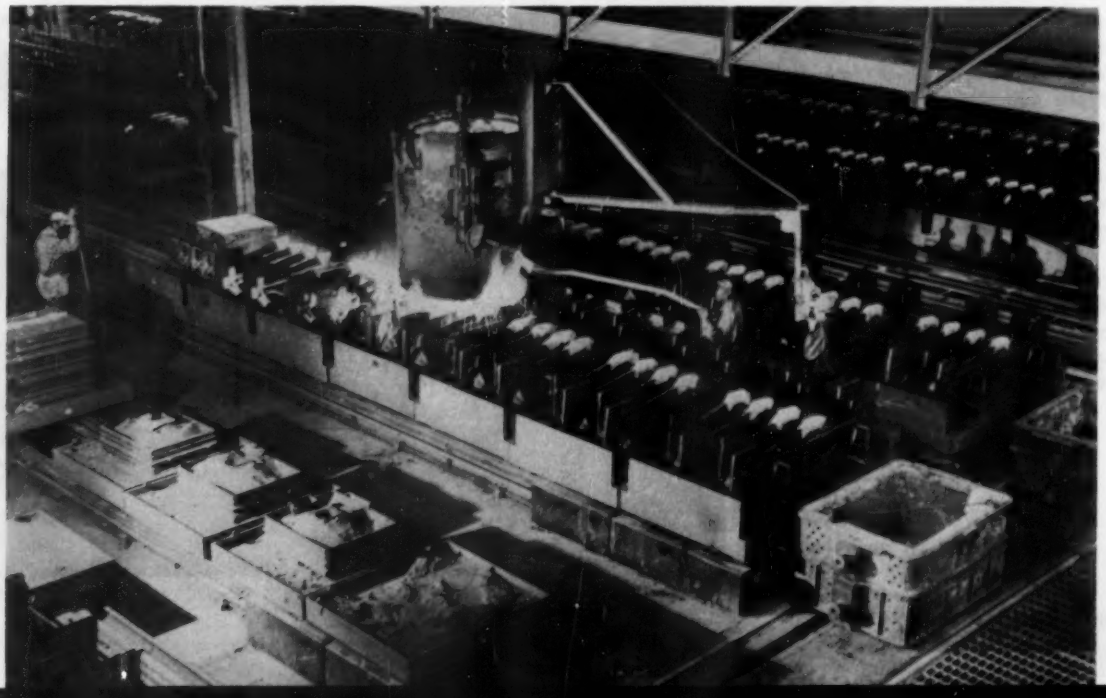
The shell molding process provides a number of selling points, particularly in the company's effort to convert users of forged or fabricated components to the use of castings. The castings are very competitive, pricewise, with forgings, particularly in the 150 lb and up class. The foundry has successfully proved to customers that its castings offer as good or better properties than forgings.

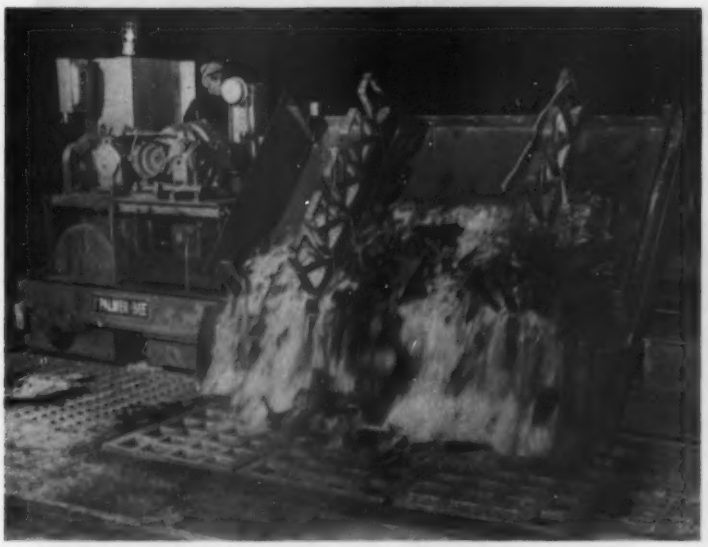
In addition, the redesign of parts to the shell molding process has permitted considerable weight reductions in most instances. Also, surface finish of castings is good; in some cases it has been measured at 120 microinches rms. Dimensional accuracy and tolerance control of most cast parts is such that machining and drilling operations are reduced greatly. In some cases these operations can be eliminated. A high level of dimensional and quality uniformity also has been obtained in cast parts.

. Management has determined that the cost of parts ready for their intended use is about the same for components cast in zircon sand shell molds and those cast in silica sand shell molds despite the fact that zircon sand costs six to ten times more than silica sand. That difference in cost is offset in part by the fact that the zircon sand is reclaimed. It is more refractory than silica sand and consequently does not break down as much during the casting and reclaiming processes. Another offsetting factor is the good compatibility of zircon sand and phenolic resin. A small percentage of resin provides adequate sand bond for mold and coremaking.

Sand Preparation—All sand used in the foundry is zircon sand in the size range of 110-130 mesh. Sand used for molds and cores is warm-coated with phenolic resin. Zircon

Molten steel is poured into the shell molds to turn out cast freight car brake beams which weigh about 130 lb. Shell molds are supported in racks on mold cars





After the cast brake beams are removed, the mold cars containing residual molding sand are carried by self-propelled car to dump station

Prior to pouring, molds are put in flasks and backed with sand

sand also is used for bedding-in and back-up of molds. Naturally it is uncoated. The integrated sand system involves reclamation, preparation, and delivery.

Sand at shakeout points falls to either of two oscillating pan conveyors in the basement. They feed into a common 6-ft-wide oscillating conveyor which carries the sand under a magnetic separator to a vibrating plate punched with ¼-in. holes. Sand passing through the holes is directed by chute to a bucket elevator emptying into a 600-ton silo. Lumps vibrate off the end of the punched plate to a hammer mill which discharges to the same elevator.

Sand from a shelf in the silo is moved by screw feeder to a vibrating screen to another screw feeder to a rotary gas-fired kiln. Here the sand is heated to 1850° F to burn off residual resin and carbonaceous matter. The hot sand is discharged to a rotary cooler from which it emerges at about 150° F for handling by oscillating feeder, bucket elevator, and vibrating screen to a 160-ton bin. The reclamation system is automatic and handles 10 tons of sand an hour.

Sand flows from the storage bin to a rotary preheater from which it is discharged to a weigh hopper. One-ton loads are dumped to a skip hoist bucket for supplying either of two sigma blade mixers. Liquid resin is metered, and the other additives weighed or metered. Resin-coated sand is discharged from each mixer to its own vibrating screen.

Coated sand passes through these screens to a third, common screen and to an inclined belt conveyor. A swiveling chute at the end of this conveyor directs coated sand to cone-bottom discharge buckets at first floor level. A bridge crane carries filled buckets to hoppers over automatic mold and coremaking machines.

Zircon sand used for bedding-in and backing up some of the molds is taken from the bottom of the 600-ton storage silo to bucket elevator and overhead distribution belts to hoppers at the mold setup stations.

One man controls and operates the sand reclamation, preparation, and distribution system from a group of pushbutton control panels. All sand transfer points in the automatic system are hooded and exhausted. Mixers used for coating the sand are totally enclosed.

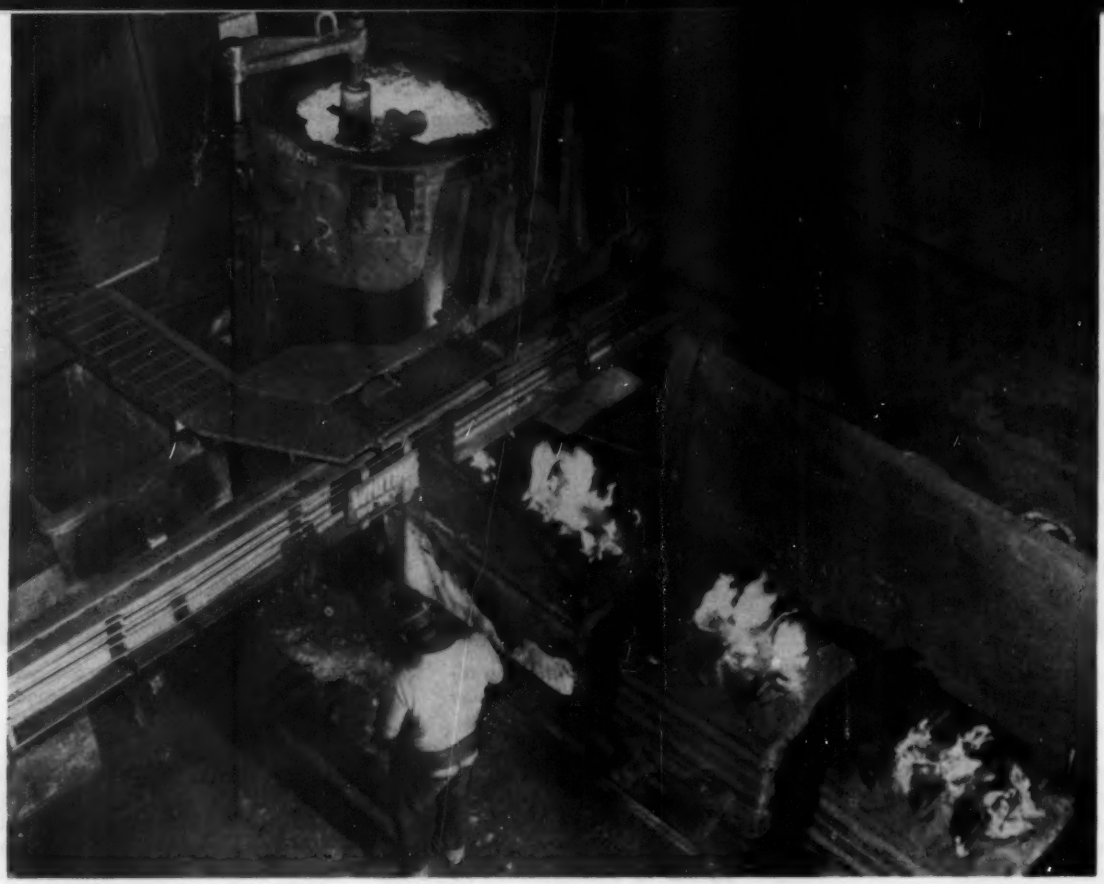
Molding—Molds are produced on seven dump-type shell molding machines. Two of the machines are producing 26 x 80-in. shells on a cycle of 2¼ minutes. One produces drags; the other makes copes.

As lift pins raise a drag off the pattern, reach-in arms on an air-powered carriage move under the shell. The pins lower, depositing the shell on the arms. The carriage moves back, and clamping pins lower to hold the shell against the arms as it is rolled over. The clamping pins then lower the drag shell, face up, to holders on a four-station, rotary machine. The machine indexes to the closing station where workers set required cores and apply adhesive to the mating surface of the half mold.

Meanwhile, reach-in arms of an air shuttle device have removed a completed shell from the cope machine to a position under a monorail. A mechanical, scissor clamp mounted on a self-propelled, self-cycling monorail trolley lowers to grasp and lift the cope shell. It is carried to the drag and lowered, closing the mold. The turntable indexes to the next station where spring-loaded clamps hold the mold halves together until their residual heat cures the adhesive.

A worker at the fourth station uses a double hook yoke suspended from an electric hoist on a bridge beam to lift the mold and set it on holders of a mold-pouring car which rolls on floor rails. These molds are for brake beams used on railroad freight cars and are poured vertically at the center of the long edge of the mold. The molds are unsupported except for the holders to keep them upright. The molds take 180 lb of steel, and the casting weighs about 130 lb as cleaned.

The cars on which the molds are loaded have about 2 or 3 in. of



The hydraulically-operated pouring unit permits accurate pouring control of molten steel as it flows into the friction shoe shell molds carried on the conveyor

zircon sand in the bottom to catch any spilled metal. The sand is placed on the car from hoses attached to two swiveling spouts at the bottom of a supply hopper. While being loaded, the cars rest on another car which is self-propelled and aligns the mold-carrying car with any of several sets of rails on which the mold-carrying cars are rolled. Molds are poured along these rails.

Other Mold Production—A second mold production setup, identical to the one described above except that the molds are 44 x 55 in., is situated adjacent to the first production unit along the rails traversed by the self-propelled mold car carrier. Fifth wheel castings are produced here. About 325 lb of steel is poured to produce the wheel casting which weighs approximately 225 lb as cleaned.

Shell molds for the wheel castings are poured horizontally. Buckling of the mold from the hot metal is prevented by clamping a bar across the cope to hold the mold firmly against a zircon sand bed on the pouring car.

The three additional molding machines produce 26 x 40-in, shells. Two of these machines are situated side by side so that they may be used for cope and drag work, utilizing the full size shells as mold halves. Combination cope and drag shells are made on a single plate to make 20 x 26-in. molds. Most production of the third machine is of that type.

A swing-in platen mold clamping device is situated at each machine. Workers handle molds between molding and clamping machines and cover the pouring basins of all molds with paper held in place by thermoplastic resin adhesive. The paper keeps foreign material out of the mold, especially during the operation of mold back-up with zircon sand.

Pouring and Shakeout—As described previously, molds from the two automatic production units are poured on cars resting on a series of parallel rails extending from the molding area. A bottom-pour ladle on a gantry crane pouring device is used. The ladle is mounted in a rack which raises and lowers and traverses the crane beam. A worker may control movement of ladle and crane from a pendant control box or from a cab on one leg of the gantry.

Cars containing poured molds are pushed toward the ends of the rails. Solidified castings are lifted by crane to boxes or to racks for movement to the cleaning room. The cars containing bedding sand and residual

The upper half of the flask is raised, allowing the casting to drop to the shakeout grill

molding sand are rolled off the rails to a self-propelled car and moved to a floor grid through which sand is dumped to an oscillating conveyor.

Molds from the three smaller molding machines are loaded to shelves on carts and rolled or transported by lift trucks to an indexing car conveyor loop. Workers load the molds on edge in a metal box which is hinged at one side of the conveyor car top. Sand from an overhead bin is directed by hose around and between the flasks. As the sand flows in, the box is vibrated to pack the sand. An exhaust hood at this station removes dust from the mold-backing operation.

The car conveyor is indexed to the pouring station. Here a bottom-pour ladle is held in a positioning device mounted in a framework above the conveyor. Hydraulic cylinders controlled through pushbuttons can move the ladle in four directions to position the spout over pouring basins of the molds. The ladle stopper is lever-operated by a worker in the usual manner.

At shakeout, hooks powered by air cylinders lift the boxes to discharge sand and castings. Sand falls to an oscillating conveyor for movement to the reclamation system. Castings go off the shakeout grid to an inclined apron conveyor which carries them up to waist-high level. Workers hook the castings from the conveyor, segregating them to tote boxes.

Cleaning and Heat Treating—A bridge crane moves the loaded boxes to the cleaning room where workers unload the castings to wooden pallets on waist-high roller conveyors. The pallets are pushed to friction band saws where gating metal is removed. All gates and risers with connecting sections of 1 sq in. or less are cut off with bandsaws. Gating metal on larger castings is removed by flogging or oxy-acetylene burning.

All castings are normalized. Some receive additional treatments of tempering or quenching and tempering. Heat treating equipment is gas fired and consists of five normalizing, six tempering, and one salt bath furnace, plus special quenching facilities.

Castings are cleaned in a skip-hoist-charged airless blast tumbling machine or on a table blast unit. Finish cleaning is done with portable air grinders. Smaller castings, after blast cleaning, are loaded to wooden pallets on a waist-high roller conveyor. Switches in the conveyor permit rolling the pallets to spur conveyor sections. Castings are ground and inspected at benches along the spur conveyors, then loaded to boxes for shipment.

Brinell, Magnaflux, Magnaglo, and ultrasonic testing equipment plus a 250,000 volt x-ray machine are included in the foundry's facilities for control of casting quality.

Coremaking—Cores are made of the same resin-coated sand employed for molds. Both hollow and solid cores are used, and several types of machines are employed in their production.

A five-station machine produces cores by the dump, blow, or combination dump-blow methods. Identical or different coreboxes may be mounted on the five separate arms of the machine. Two double station shuttle blow machines, four automatic dump-blow machines, and eight manually-operated dump-blow machines are included in the coremaking equipment. Cores are loaded, after a minimum of touch-up work, to racks for delivery to the molding department.

Coreboxes, like patterns, are of Meehanite or fine grain cast iron and are produced to meticulous specifications by outside suppliers. The boxes are operated in a temperature range of 450 to 550° F, depending on core size and configuration and on other variables.

Melting—Steel is melted in three basic-lined arc electric furnaces. Two have a 10-ton charge capacity; the other takes 5 tons. All three furnaces are charged through the top.

Melting practice involves a single slag procedure. In the case of a special steel to which the company has applied the trademark name Wearpact, the bath is treated with boron and rare earths to develop hardenability and impact strength in the metal.

Grade B and high tensile steels are produced as well as the high impact, high hardness Wearpact steel. Wearpact steel, when heat treated to the normal range of 470-520 Bhn, has tensile strength exceeding 220,000 psi and a yield point exceeding 180,000 psi. Charpy v-notch impact strength is approximately 20 ft-lb, elongation about 10 per cent, and reduction of area about 22 per cent.

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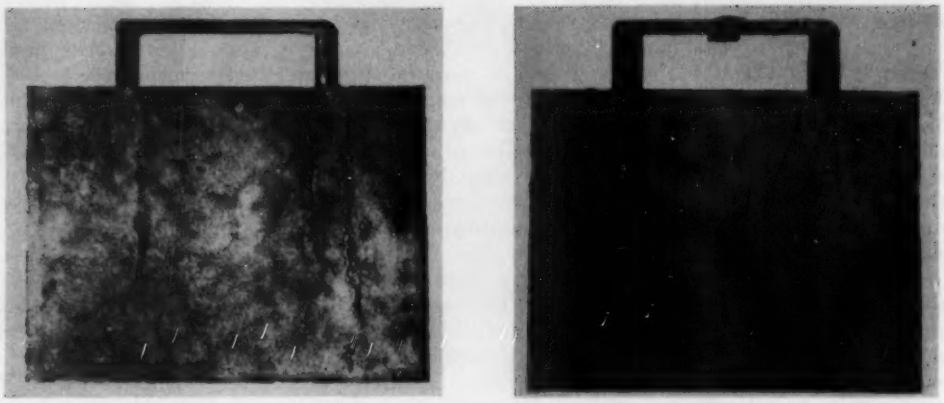
The operator of a two-machine station such as this can produce up to 480 cores per machine in 8 hr

One of the various types of shell core units, this machine produces cores from resin-coated sand



A B

Fig. 8—Comparison of flow patterns on the drag surface for full-round and half-round gates. A—Full-round gate: Runner diameter, 1 in.; ingate diameter, 1.4 in. B—Half-round gate: Runner diameter, 1 in.; ingate diameter, 2 in.

Gating Steel Castings

This concluding article on gating steel castings discusses metal cleaning devices and factors which determine size, shape, and placement of gates. It is No. 10 in our series of gating and risering articles

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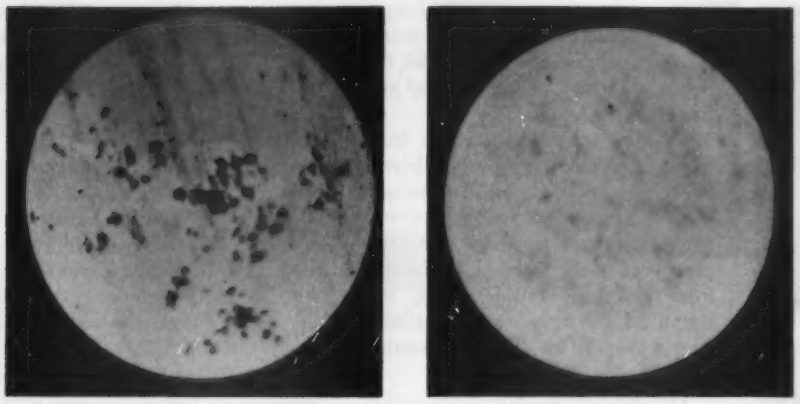
● SEVERAL DEVICES are used by steel foundrymen to entrap slag, dirt, and eroded sand originating in or outside of the gating system and prevent them from entering the mold cavity. The use of slag traps, strainer cores, gate wells, whirl gates, and similar devices in steel foundries is fairly widespread but not universal. Although these devices commonly are used, it is surprising to note that few studies have been conducted to evaluate their usefulness and efficiency. The whirlgate has been given the most attention and has been evaluated properly.

Broadly speaking, two kinds of traps are used: 1. Those which prevent entry into the mold cavity of the first metal to pass through the gating system. 2. Those which filter or otherwise clean all the metal passing through the system.

Slag traps of the first type usually consist of a blind end of a runner near an ingate or at any position where the gate system changes 90 degrees. These blind ends of runners may or may not terminate in a small sump. The first-poured metal flows down the runner, its momentum carrying it past the ingates into the blind end. When the blind end has been filled and backpressure generated, metal passes through the ingates into the mold cavity. The first-poured metal, carrying dirt and slag with it, thus is diverted out of the flow system proper and does not enter the casting.

Most steel foundrymen agree that the slag trap is a highly desirable part of a gating system, but it is not used regularly because it adds to molding cost and results in lower casting yields. A method used by a number of steel foundries is to keep the runners in the drag and the ingates in the cope. By using short extensions of the runners past the ingates, local traps are produced which possibly give some usefulness without changing the casting yield perceptibly.

Use Other Devices—The metal cleaning devices generally used in the steel foundry are the pouring basin, the strainer core, and the whirlgate. Only those pouring basins which contain a dam have any possible cleaning capacity. The



A B

Fig. 9—Effectiveness of a whirl gate in reducing sand in a mold cavity. A — No whirl gate between the sprue and the mold cavity. B— Whirl gate of optimum design was employed

strainer core usually consists of a disk-shaped ceramic body containing a number of holes. It is inserted in the sprue or between the runner and the sprue basin perpendicular to the direction of metal flow.

The small total hole area of strainer cores gives them a choking effect, and they cut down on the total flow of metal in a time period. Since steel castings usually are poured at a fast rate, strainer cores are not used too extensively. Also, little technical information is available as to their usefulness or efficiency in eliminating nonmetallics. It seems to the author that strainer cores exert negligible filtering effect, and their main value is a means of controlling pouring rate and reducing flow velocities.

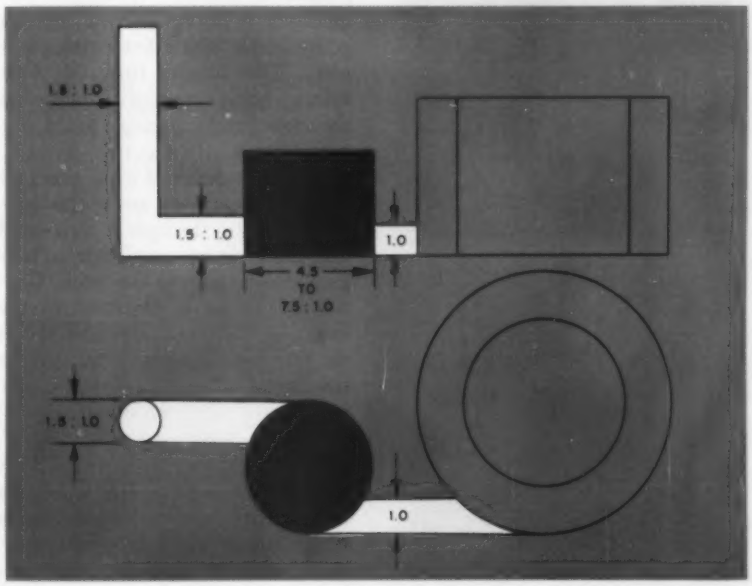
The sprue base is used primarily to decrease velocity of the metal flow. In doing so, however, it retards erosion of the runner and ingate walls and lessens the amount of sand entering the mold cavity. Several studies have been made on sprue bases, but they have dealt with the effect of metal head and velocities, and no information has been presented as to their ability to lessen the amount of nonmetallics entering the mold cavity. Further work is needed in this field, especially in connection with gating of steel castings.

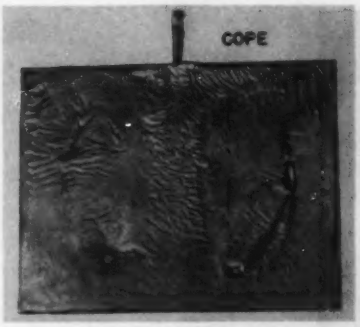
The flow pattern obtained with half-round runners and ingates is similar to that obtained with the full-round system. However, differences exist in the effects of erosion. The outline of the erosion pattern obtained with the round gates is an elongated hourglass; the erosion pattern obtained with the half-round gates is almost that of two parallel lines[1] as shown in Fig. 8.

The difference in the erosion pattern is attributed to the fact that the initial stream discharged from a round ingate is round and can be pictured somewhat like a coin standing on edge. Immediately upon leaving the gate the stream begins to slump and spread out, producing the fan-shape characteristic of round gates. The stream from a half-round gate, however, already is slumped and so does not spread out as much as that from a round gate. Also, because of the more stable initial stream cross section, the stream from the half-round gate has less tendency to whip or break. Therefore, half-round gates produce less erosion than full-round gates of the same diameter.

Steel foundrymen have used whirlgates sporadically for many years; however, the greatest interest in their use has been during the past five years. The advantages and disadvantages of using whirl gates are: Advantages: 1. Cleaner casting surface appearance. 2. Lower cleaning room cost. 3. Lower machining cost. 4. Lower casting rejection rate due to inclusions of dirt and other foreign material. Disadvantages: 1. Added pattern cost.

Fig. 10—Optimum design for a whirl gate. Centrifugal force causes the metal to leave the cup-shaped basin through the tangential outgate





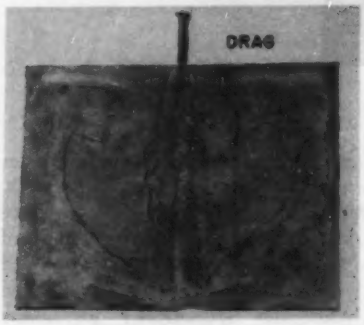
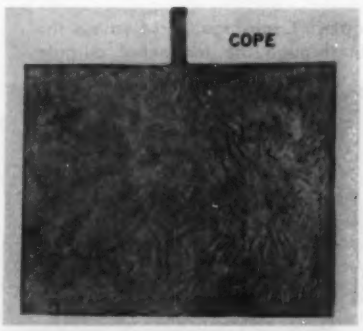


Fig. 11—Improper gate doesn't fill casting. Plate casting 8 by 24 in. with a ¾-in.-diameter sprue and ingate system

Fig. 12—Larger gate system of 1.4 in. diam produces a better casting, with fewer wrinkles and cold shuts



2. Lower casting yield. 3. Larger flasks required. 4. Increased worker incentive rates resulting from the necessity of handling more sand and larger flasks.

Do whirl gates remove dirt from metal streams? Rather elaborate whirl gates may be built to accomplish almost complete dirt removal from the metal stream. The complexity of such gates is intolerable from practical considerations, but simplified designs are available which provide an efficient cleaning action.

Two Sources of Dirt—Eliminating dirt from steel entering the mold cavity by the whirl gate is a twofold problem. First, dirt from sources external to the mold, such as slag or ladle lining material, must be trapped. Second, dirt generated within the system, as by erosion, spalling, or unclean passages, must be trapped before it enters the mold cavity. The second condition logically requires a whirl gate at every ingate to the mold cavity. Such a requirement would result in low casting yield if more than one ingate were used.

Locating the whirl gate between the sprue and the runner would eliminate dirt from external sources as well as that generated in the sprue and at the sprue base. If a low pressure gating system of 1:2:2 or 1:2:1.5 were used, the dirt generated after the metal left the whirl gate could be small, if care were exercised in the construction and inspection of runners and ingates of a manifold system. Whirl gate performance is improved by increasing pouring rate with a fixed gating system. This implies that, all other things being constant, increasing the sprue height improves whirl gate performance.

A properly designed whirl gate provides for metal to enter the cup-shaped basin through a tangential ingate and to leave through an outgate also tangent to the basin. Centrifugal action is imparted to the metal in the basin. Fig. 9 shows the effectiveness of a whirl gate in reducing sand in a mold cavity. The optimum design for an economical whirl gate is shown in Fig. 10.

A whirl gate is a more efficient dirt trap than is a simple stilling basin of the same size. In fact, a whirl gate is the most positive device for preventing dirt from entering the mold cavity. The design of a stilling basin permits metal to flow straight across the circular basin and exit from a gate on the opposite side.

Recommended dimensions for whirl gates for steel castings are as follows[4]:

1. Best results are obtained for castings, especially small or short castings, if the whirl ingate is larger than the whirl outgate. A reasonable ratio of ingate to outgate diameter is about 1.5 to 1.0.

2. Best whirl gate performance is obtained if both ingate and outgate are at the bottom of the whirl cavity.

3. Whirl gate performance is improved by increasing the angular displacement between the tangential ingate and outgate. A reasonable orientation appears to be 180 degrees apart.

4. Optimum whirl gate basin diameter appears to be between three and five times the ingate diameter.

5. Whirl gate basin height should be not less than 1½ times the ingate diameter. No particular advantage is gained in using heights more than 2½ times the ingate diameter, except in the case of large castings or very dirty metal.

Aspiration and Ceroxides—Aspiration of air in the stream of molten steel is possible at several positions in a gating system. Air is entrained in the stream and carried down the sprue if a proper pouring basin is not employed, or if the pouring basin is so positioned that the stream of steel from the ladle falls directly in the sprue entrance.

Aspiration also occurs as a result of vortex formation if metal level in the pouring basin is not kept sufficiently high. This is the case especially when pouring directly into tapered sprues or large funnels cut in the mold. Swirling and vortices in the stream occur more readily in round than in rectangular basins. Also, vortices occur at sharp changes in direction of gates, such as the 90-degree change of flow from the sprue to the runner. These places always are positions of air entrainment.

These comments on aspiration indicate that ample opportunity exists for oxidation of molten steel in many gating systems while the steel is flowing through the gates prior to entering the mold cavity. This oxi-

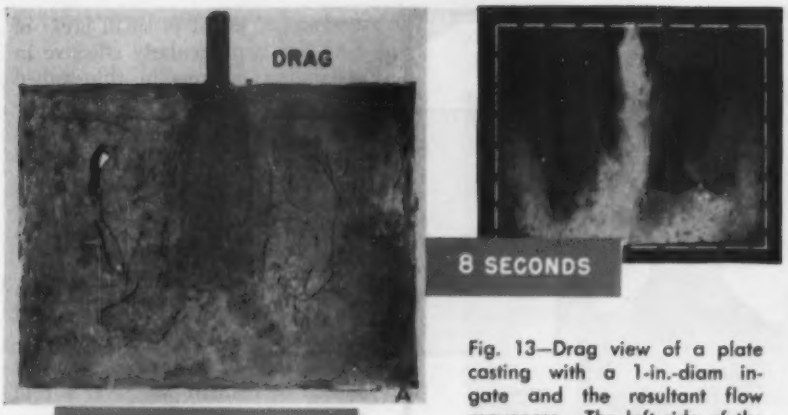
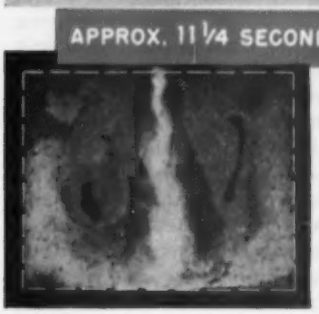


Fig. 13—Drag view of a plate casting with a 1-in.-diam ingate and the resultant flow sequences. The left side of the drag plate is the right side of the flow pattern. Above, A left and B right. At left, C



dation may be one of the causes leading to the formation of the ceroxide defect. That is defined as a shallow depression usually found on the cope surface of a steel casting and occasionally on a vertical surface. It is caused by the formation of a low fusing, nonmetallic substance during the time the mold is poured; it does not originate from the ladle lining.

A significant suggestion[5] is that the ceroxide defect results from oxidized elements in the steel. The oxidation is caused by aspiration of air into the metal stream in the gate system and by an oxidizing atmosphere in the mold cavity. The resulting corrosive constituent reacts with the molding material, particularly eroded sand from the gates, to form a viscous material which lodges in the casting.

Poor gating practices apparently add to the amount of ceroxide in at least two ways. Turbulent flow produces excessive aspiration of air and mold gases into the gate system and permits greater contact between incoming metal and the air or gases resulting in the corrosive oxides. Such conditions would produce dross in nonferrous metals.

Dross, however, is not a problem in the gating of steel, but perhaps the ceroxide defect is a comparable problem. Gating systems which confer increased turbulence to the metal also produce more gate and mold erosion which, in turn, results in ceroxides of higher viscosity. The higher viscosity results in a deeper, more pronounced defect in the casting. Calcium, aluminum, manganese, and silicon probably contribute to ceroxide formation.

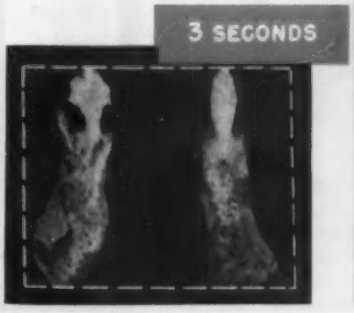
Detailed research of the factors contributing to the ceroxide defect is being conducted in several places, therefore, the importance of the role of the gating system in producing ceroxides can not be stated factually. It does seem, at the moment, that stream aspiration may have certain responsibilities regarding the ceroxide formation.

Wrinkles, Cold Shuts, and Misruns—The gating system must be adequate to fill the casting cavity. Perhaps the best way to emphasize this is to refer again to illustrative examples. Fig. 11 shows an 18 x 24-in. plate casting gated with a ¾-in.-diam sprue and ingate. This gate is insufficient to fill the casting properly. Both the cope and drag surfaces show numerous wrinkles and deep cold shuts illustrating the metal flow pattern. A larger gate system, such as that shown in Fig. 12 wherein the gate system is 1.4 in. in diam (approximately 3½ times the gate area), produces a casting of minimum wrinkles and no cold shuts. Filling steel castings too slowly results in misrun castings with wrinkles and cold-shut surfaces. In these cases heat is lost through radiation producing temporary surface solidification, and the further flow of molten metal is not sufficient to erase the cold shuts by remelting these surfaces. Fewer cold laps are present in the faster filled castings, indicating the imporance of mold pouring speed.

The gates do not always need to be larger to correct the misrun problem as can be seen from the examples in Fig. 13 and 14. In this case the area of the casting to be run by a single gate is reduced by employing more than one ingate. However, care must be exercised to be certain that the gate system is designed so that each gate is effective and carries to the casting an equal supply of molten steel. Two ingates with a centrally located sprue provide an equal supply of metal and thereby cut down, by half, the area to be run, even though small ¾-in.-diam ingates are employed.

The principle of allocating

Fig. 14—Drag view of a plate casting with two 1-in.-diam ingates and the flow pattern. At right, A; at left B



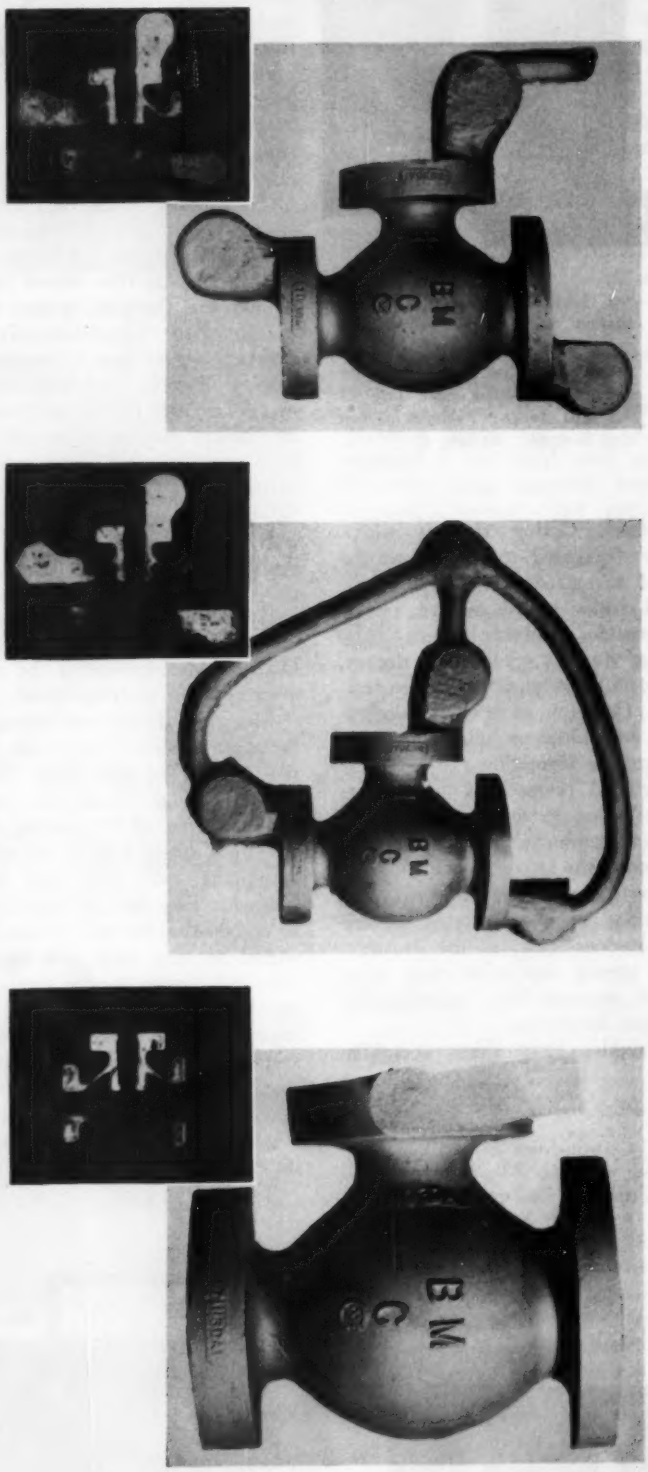


Fig. 16—Methods of gating a casting. Insets show temperature gradients in mold after 8 seconds. Top—Gate into one side riser. Center—Gate into all three risers. Bottom—Gate into bottom of top flange. Center shows the best thermal gradients

amounts of metal to small areas of a casting is particularly effective in preventing misruns in thin-walled steel castings ¼ to ½ in. thick. Furthermore, the gates pass such small amounts of metal that they do not become hot spot positions, and solidification takes place uniformly over large areas without gross shrinkage cavities being formed.

The surfaces of steel castings often are disfigured by the appearance of cold shuts. Their presence is strictly a matter of gating technique. It should be realized whenever a cold shut is observed, that its presence shows the arrest of metal flow in a particular direction, the oxidation of the surface and film formation on the metal, followed by subsequent flow in the original direction. However, the oxide film prevents the subsequent flow of metal from producing a composite mass without the telltale lines of a cold shut. Figure 13b and c are instructive examples of how flow patterns are responsible for cold shut lines and misruns.

Steel flowing in a stream will flow in a straight path until the flow is obstructed. The obstruction exerts the forces necessary to cause the stream to change direction. Steel flowing into a large cavity, such as the plate mold of Fig. 13, will traverse the mold cavity, and upon impinging on the cavity wall will double back on itself. Often the last part of the mold cavity covered will be adjacent to the ingate. The cold shuts in Fig. 13a are the result of the flow pattern of steel as shown at 8 and 11¼ seconds after start of pour, Fig. 13b and c. Note that the oxide skin which builds up may be so strong that it prevents flow into the open islands. Even though the metal builds up to considerable thicknesses, the mold cavity surface is not covered with the molten steel.

Other gating systems introduce other flow patterns. For example, Fig. 14a shows the cold shuts outlining a double ingate flow system. The flow pattern at the end of 3 seconds indicates why the cold shut lines appear as they do.

The flow pattern changes if the mold is tilted 10 degrees upward and poured uphill as may be seen in Fig. 3 (FOUNDRY, June, 1960, p. 124). The steel rises as a unit

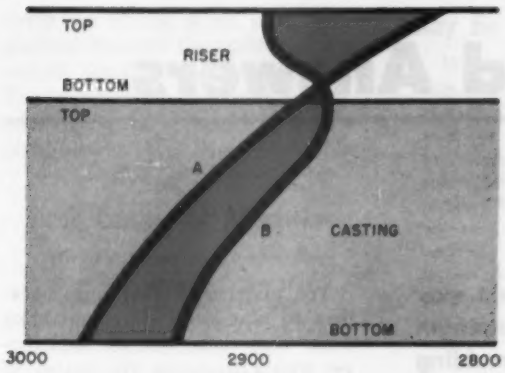


Fig. 15—Thermal gradients. A—Casting and riser filled from bottom gate. B—Casting filled from the bottom gate, with the riser filled by top pouring

and there is a smooth advance of the stream front.

These few examples readily indicate that the method of gating is responsible for the presence of wrinkles and cold shuts in castings and for misruns.

Gating and Solidification—It is well known that hot spots are the last positions to solidify in castings. Steel foundrymen create hot spots by the application of risers to castings. It is their desire that the risers solidify last and, in so doing, provide reservoirs of molten metal for the casting to draw from during solidification.

Gates, as well as risers, are potential hot spots in that they furnish the molten metal to the casting. Therefore, the mold area adjacent to an effectively operating ingate will absorb heat quickly and become as hot as the metal itself with the result that the mold in this area will have no chilling effect to promote early solidification of the steel. The method of gating a casting can result in some very pronounced temperature gradients in castings. One or two examples of the temperature gradients possible will be sufficient to recall to your memory many other similar cases.

As early as 1935 it was recognized that temperature gradients, resulting from the gating system applied, would have an adverse effect on casting solidification.[6] Fig. 15 shows the influence of bottom gating on the casting temperature gradients. It is easily seen from this figure that such a gating system would create hot spots in the mold adjacent to the bottom gate. The hot spots would delay solidification of the metal in that area, creating shrinkage cavities. Top-filling the riser changes the temperature gradient as shown by curve B, Fig. 15, but creates only a locally favorable condition which has no beneficial effect in the lower mold levels.

A better example of the importance of temperature gradients resulting from gating is given in Fig. 16. These are photographs taken about 8 seconds after the start of pouring of a valve casting.[7] Use of gates to each of the risers is seen to be beneficial from the standpoint of temperature gradients. Metal is delivered fairly uniformly to each of the risers and, subsequently, to the rest of the casting. The risers and adjacent flanges are the hottest parts of the casting with a gradual change toward the colder, thin wall section.

Controlled directional solidification along the casting toward the riser should not be disturbed by improperly placed gates, since the distance that risers feed may be reduced materially. The simple sketch of a bar-type casting, Fig. 17, shows the application of this principle. The gate at the end of the bar eliminates the end effect by establishing a hot spot at the point of contact of the gate and casting. The distance that the riser can feed is only 3½T. A casting section longer than this will exhibit a shrinkage cavity along the bar.

However, a distance of 6T can be fed on the other end of the bar. Of course, the gate should enter the casting at the base of the riser to permit effective use of the hot metal in the riser to promote proper directional solidification.

It can be seen from these examples that gating can control the distribution of temperature gradients in the casting and, in turn, the mode of casting solidification. Thus gating may be responsible for shrinkage cavities in the casting.

Summary—The preceding material can be summarized briefly by the emphatic statement that the quality of steel castings can be influenced materially by the design, application, and care given to construction of the gating system. Gates influence solidification of the casting; they can be responsible for the presence of wrinkles, laps, cold shuts, and misruns; they can cause aspiration of air and other gases and erosion of the mold, leading to entrapped nonmetallics and sand, and the ceroxide defect.

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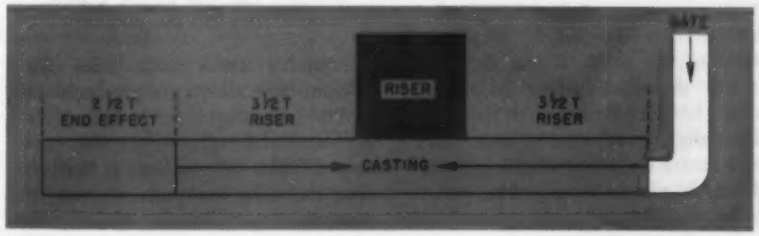
Fig. 17—Relation of the gate to the effectiveness of feeding distance is shown in this bar casting. The end gate eliminates the end effect and substantially shortens the distance which can be fed by the riser



Questions and Answers

Lack of sufficient sand around edges or warped flasks may cause runouts . . . Light alloy foundry flasks lack strength . . . Molten silver alloys absorb oxygen . . . Slush molding of aluminum . . . Pipe shows white fracture

Metal Flows Out at Joint

We operate a foundry in Europe and are interested in producing gray iron stove lids and rings by the stack molding process. We use molding machines which take a flask about 15 x 20 in. However, the pattern plates are such that in many cases there is a distance of only about ¾ to 1 3/16 in. between flask and pattern, and the metal tends to run out during casting.

In squeezing the molds the sand runs out at the top edge of the flask. We tried to prevent it by using a squeeze frame but that did not work properly, and another disadvantage was that the sand at the edges of the top flask was not compact enough.

Apparently one of your troubles is due to "runouts," if our understanding is correct. That is, the metal flows out through the joint between the flasks, and part of the difficulty is due to the narrow band of sand between flask and pattern. It should be more, but that would necessitate use of a larger flask, a procedure you wish to avoid. Possibly some of the flasks are warped slightly which results in a small opening between the two sand faces.

If that opening is only slight, it might be remedied by allowing what is termed a "crush" at the joint. This means that the sand in the flask at the joint extends a slight distance above the flask edges. It can be accomplished by using a contoured strike which, when applied to the mold, allows the sand inside the flask edges to extend about 1/16 in. higher than the flask. That slight projection of sand often will insure a sand-to-sand joint with the mold placed on top of it.

Another possibility based on your statement about the sand running out at the top of the mold, is that the squeeze board is too small and the sand is not compacted sufficiently around the edges. The squeeze board should permit only a slight clearance between its edges and the flask interior. Also, you might try placing strips of wood along the edges of the squeeze board to provide greater compaction just inside the flask edges.

Use of such a board in your case will require employment of what usually is called a sand frame—possibly the same as your squeeze frame. That requirement is because the sand will be depressed along the edges of the flask and will not provide the proper joint for stacking of the molds.

The frame we have in mind has the same interior dimensions as the flask, with small corner brackets or some other means to hold it in position on the flask. Height of the frame should be such that after the squeezing operation the mold can be struck off to a smooth surface to provide the proper joint with the succeeding mold.

Aluminum Alloy for Flasks

In our foundry in Europe we are making our own flasks, using an aluminum alloy containing 10 per cent silicon, but they are not strong enough. Can you suggest a more suitable alloy for the purpose?

Foundry flasks made from aluminum-base alloys are produced by several manufacturers in this country, and although we do not have any definite information, it is likely that the alloy compositions vary to some extent.

We understand that one maker uses an aluminum alloy containing 4 per cent each of silicon and copper with a maximum iron content of 0.8 per cent. Another silicon-copper-aluminum alloy which should serve contains 6 to 7 per cent silicon and 3 to 4 per cent copper.

Melting of Sterling Silver

We have received an inquiry on casting sterling silver golf putter heads which must be free from porosity. Are there certain precautions which must be taken in melting and molding, or can we follow the same procedures which are employed in casting aluminum?

Sterling silver has the common characteristic of practically all nonferrous metals and alloys — the tendency to absorb gases. Consequently, care must be taken during melting to keep the gas pickup as low as possible and to degasify the melt prior to pouring.

Silver has a strong avidity for oxygen and will absorb or occlude up to 22 times its volume of that element when in the molten state. Like many other metals and alloys, the gas is held in suspension until just before solidification when it is ejected with almost explosive force, giving rise to what is termed spitting or sprouting. That action results in little projections, whiskers, or sprouts on the surface of the silver.

Absorption of oxygen during melting of the silver is minimized by maintaining a cover of dust-free, dry granulated charcoal on the molten bath. Charcoal should be placed on top of the solid metal at the beginning of melting to insure dryness of charcoal and presence of a protective atmosphere at all times.

After the silver is raised to the desired pouring temperature and just prior to pouring, it is degassed by addition of a small amount of metallic cadmium—0.25 to 0.50 per cent or from 1 to 2 oz per 25 lb silver. Since cadmium has a rela-

tively low boiling point, it must be plunged beneath the surface of the molten metal to function properly. That can be done by wiring the cadmium to a rod, or placing it in a phosphorizer.

Slush Casting of Aluminum

We are interested in obtaining information on slush casting of aluminum alloys, including method of casting, alloys used, melting method, types of molds, etc.

Little information apparently has been published on slush molding of aluminum, but indications are that pure aluminum as well as the commercial alloys could be used. The nature of the process dictates employment of alloys having short freezing or solidification ranges. For example, the 5 per cent silicon alloy with a solidification range of about 95° F should be preferable to a 7 per cent copper-1 per cent zinc alloy with a range of 170° F.

Molds for slush casting are made of cast iron and usually are two-part type split longitudinally. They are equipped with handles and mounted on trunnions so that they may be tilted for filling and dumping, or slushing, as it commonly is termed.

The filling or gate end is arranged in a gentle slope, and when filling is begun, that end is turned so that it is at the lowest point. As the operator pours metal from a small dip ladle into the gate, he gradually turns the mold upward to permit the metal to enter the cavity slowly and gently. The metal is allowed to remain in the mold until the desired wall thickness is obtained. Then the gate end is turned down to empty the remaining liquid metal into the ladle. That metal is returned to the melting furnace close by.

Wall thickness of the casting is controlled by mold temperature, metal temperature, rate of filling, and holding time before dumping. Molds usually are heated at the beginning of operations by pouring a number of dummy castings until they are free from cold shuts. Mold operating temperature may be controlled by the rate of operation or by immersing the mold in water from time to time. Melting procedure for aluminum for slush molding is the same as for other types of molding.

May Be Careless in Charging

We are enclosing a portion of a 4-in. soil pipe in which you will note that the white fracture occurs as a skin in some areas and solid in others. Our typical analysis shows 2.40 per cent Si, 0.36 to 0.40 per cent Mn, 0.488 per cent P, 0.13 per cent or less S, and 3.37 per cent TC. Analysis of the enclosed section shows 1.63 per cent Si, other elements the same.

We are using a 3000-lb charge composed of 300 lb pig iron, 2700 lb scrap and returns, and 30 lb Ferrocarbo. Cupola is hotblast type with an air temperature of 550° F. Coke splits range from 300 to 310 lb, and 90 lb of stone is used per charge. We are melting 51 tons in about 3 hours. Soda ash is used for sulfur control. We run into this white fracture condition every so often, generally in only a small part of the heat. Scrap iron used is the usual run of No. 1 cupola scrap.

Your mention that the silicon content of the soil pipe section is 1.63 per cent is sufficient evidence

Soil pipe shows white fracture

to determine the cause of the white fracture. It is much too low to permit the desired graphitization to take place in the relatively thin (3/16 in.) section involved. Preferably the silicon content should be in the vicinity of the 2.40 per cent you indicate as typical of the iron you are using.

Although we can account for the reason for the occurrence of the white fracture, we can only guess the cause of the drop in silicon content from 2.40 per cent to 1.63 per cent, or a loss of about 32 per cent. Possibly the silicon carbide addition to the charge was omitted, but that would account for only about a 15 per cent loss in silicon content of the iron, unless it occurred in combination with inadvertent charging of considerable low-silicon scrap iron.

We suspect, however, that the difficulty lies in carelessness in charging whereby the charges of iron are placed in the cupola in such a manner that they form an open structure instead of a relatively compact mass. Such a condition will result in highly oxidizing conditions while the situation exists. As the open structure charge is followed by compact charges, the melting conditions gradually go back to normal.

Mold Material for Castings

We understand that plastic molds can be used in making art castings in brass. Do you have any information on this process?

The only process we can think of in which some phase involves what can be termed a plastic mold is a proprietary method known as the Shaw process. It is similar to investment molding except that instead of disposable patterns of wax or polystyrene, it usually employs patterns of wood, metal or plastic.

Molding material is similar to that used for the investment process —silica sand or other refractory bonded with hydrolized ethyl silicate solution plus a gelling control agent. The molding material is in the form of a thick slurry and is poured over the pattern. In a short period of time the material air hardens or sets into a mass possessing rubber-like characteristics which permits removal of the pattern without damaging the mold face. After removal of the pattern, the mold is ignited to burn off the alcohol contained in the hydrolized silicate, then gradually heated to a high temperature to drive off all moisture, and convert the ethyl silicate to silica.

Because some terms are applied rather loosely in the foundry field, the term "plastic mold" might have reference to molding sand bonded with chemically treated bentonite. Paraffin oil is used to activate the bonding agent, instead of water as in the case of the commonly used bonding agents. A brief description

of use of such a sand in production of art castings appeared in the March issue under the title "Foundryman Markets an Idea" on Page 150.

Oxides Are Cause of Trouble

Normally our small yellow brass castings are quite satisfactory, but from time to time different ingot shipments cause trouble. Alloy composition is 66 per cent Cu, 1 per cent Sn, 2 per cent Pb, 0.35 per cent Fe, 0.5 per cent Ni, and remainder Zn. Difficulty is that the metal has a tendency to be drossy and brittle and has a drab, grayish color. Shrinkage is greater, and more misrun castings are encountered. We add about 0.2 per cent Al to the metal.

Your trouble seems to be due to occasional shipments of ingot which are unusually drossy due to residual aluminum or careless manufacturing technique. Either could cause yellow brass to be brittle and have a drab, gray color or include oxides. The most likely oxide is aluminum, although careless manufacturing technique could introduce excessive quantities of zinc oxide.

The statement that the troublesome metal tends to promote more misruns is revealing since it indicates that excessive oxide content has something to do with the problem. It is well established that presence of oxides in copper-base alloys reduces fluidity or castability. This lack of mold filling ability also tends to cause shrinkage in the castings because the metal does not feed properly.

We believe the remedy is to make certain that the purchased ingot is free from aluminum, and manufactured to a quality specification. There should be no included dross on the top surface of the ingot, and melt-down dross should be normal.

Cooling Affects Structure

We are having some difficulty with large cylinder liners we are making in that after heavy machining cuts on the interior and exterior of the wall, segregated splotches appear. The castings are made in dry sand molds and poured vertically through pop gates using a pouring basin. Iron contains 1.40 to 1.50 per cent silicon, 0.80 per cent nickel and 0.20 per cent chromium.

Although location of the splotches is not mentioned, they probably appear in the upper portion of the liners and are due, we believe, to the difference in cooling rate between the lower and upper portions. Considerable heat is lost by the first metal as it descends, and it solidifies faster than later incoming metal, which falls a shorter distance and loses less heat.

With slow cooling there is a tendency for greater precipitation of graphite and coarser grain structure. Temperature of the metal also has an effect since the higher the superheat, the slower the cooling.

Apparently the condition you mention occurs only from time to time, and possibly a closer check on pouring temperature would be a remedy. Try pouring at different temperatures and establish the range where satisfactory results are obtained. Control of the pouring rate might be another method.

By experimenting with the size and number of pop gates, you should be able to establish a more uniform cooling rate. An alternative method would be to place denseners in the top section of mold or core. Those are metal chills with a thin layer of sand between them and the face which comes in contact with the molten metal.

Sand Needs Consideration

We make brass castings up to about 15 lb in weight and are using a sand with a permeability of 6.5, green compression strength 7.3 psi, and moisture content of 7.6 per cent. Screen analysis shows 0.80 gram on the 40 mesh, 5.0 on the 50 mesh, 13.0 on the 70, 12.0 on the 100, 6.0 on the 140, 5.20 on the 200, 5.0 on the 270 mesh, and 39.0 grams on the pan. Clay is 14.0 grams. This gives an AFS fineness number of 183, but we think it is a little on the coarse side.

If you are considering small, light-sectioned castings where surface smoothness is important, your sand might be termed on the coarse side, but for the heavier castings it would be the converse. From your screen analysis it appears that the sand has poor grain distribution since 30 per cent is on the 70 and 100 mesh screens and 45 per cent on the pan. We would expect that the sand might lead to difficulties from high expansion, decreased flowability, and high hot strength, with trouble from washing, scabs, buckles, etc.

A better distribution would be to have more of the sand on the 140, 200, and 270 mesh screens. A high content on the pan increases the fineness number and fills the voids between the coarser grains, but it reduces the permeability drastically.

Finer grain sizes reduce permeability also, but not as much as the extremely fine pan material. Sands containing considerable fine material require more moisture to make them workable, and tend to be weak because the fines have no bonding power.

Zinc Trays Grow and Crack

As you will note, the copper plated ash tray we are submitting for your consideration is badly cracked and distorted. It is three or four years old and returned to the customer for whom it was made. It is one of several with the same appearance. The ash tray is made by slush molding from a zinc-base alloy containing 5 per cent Al, remainder Zn. The customer supplies the zinc, which sometimes is scrap, and we add the aluminum. We suspect that is the cause of the trouble, but we never have seen a casting like this before, and would like to know if you can suggest the reason.

Your surmise that the metal is the cause of the cracking and distortion is correct. It results from the presence of small amounts of lead, cadmium, or tin. Those elements, usually referred to as subversives, cause accelerated growth and intergranular corrosion, hence the specifications for zinc-base alloys and slush molding have the following maximum limitations: Pb—0.007 per cent, Cd—0.005 per cent, Sn—0.005 per cent, and Fe—0.100 per cent. Undoubtedly neither you nor your customer was aware of those limitations in composition.

One method of determining whether or not the Pb, Cd, Sn, and Fe are within the desired limits is use of chemical determinations. Another procedure is to subject test specimens of the alloy to steam vapor at about 205° F at atmospheric pressure for 10 days. Growth and cracking developed under test conditions usually indicate that they will show up in the castings in one to two years.

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What's New in Equipment and Supplies

SAND MULLER

Muller is designed for batch mixing of core and molding sand with any type of binder. Unit is said to mix up to a 400-lb batch in less than 1 min and to discharge as

fast as the operator can handle. It stands 4 ft high and occupies 7 sq ft of floor space. Simplicity of design is claimed to eliminate maintenance problems.—**Foundry Sales Dept., Frederic B. Stevens Inc.**, 1800 18th St., Detroit 16, Mich.

For More Details Circle No. 450—Page 53

GAS BURNER

Uniform furnace temperature for heat treating is said to be obtained by using excess air with Series 4423 sealed in, nozzle mix gas burner. Uniform temperature is achieved by lowering gas intake while maintaining an excess air rate. Cast iron mounting plate and burner body are combined into one piece, with 9-in. burned ceramic tile attached. Unit features a flame monitoring device. Either interrupted or constant pilot can be used with the burner.

Largest burner (1½ in.) can be regulated from 431 to 52 cu ft per hr of natural gas when using 16-osi air pressure. Hot mix temperature then issuing from the tile is less than 700° F, and the flame is entirely in the tile. Burner is available with air pipe sizes of ¾ to 1½ in. Range of 70,800 to 431,000 Btu per hr is possible at an air pressure of 16 osi.—**North American Mfg. Co.**, 4455 E. 71st St., Cleveland 5, Ohio.

For More Details Circle No. 451—Page 53

CHAIN CONNECTORS

Alloy-studded C-links provide a detachable chain-to-chain connection. The links are for use where endless slings cannot be applied to the proper position on a load, such as castings.

Normally used in conjunction with a sheave wheel on which the chain runs to facilitate rotation of the work, the links are fabricated in three sizes—¼ x 2 in., ⅜ x 2 in., and ½ x 2 in. and are attached to a

2-ft section of alloy chain.—**American Chain & Cable Co.**, 929 Connecticut Ave., Bridgeport 2, Conn.

For More Details Circle No. 452—Page 53

TRACTOR-SHOVELS

Series B Models H-70 and H-90 Payloader tractor-shovels feature dual foot brake pedals for braking with or without transmission engaged. Model H-90 has operating capacity of 9000 lb and peak lift of 18,000 lb. Wheelbase has been extended and tread has been widened

over previous model. Cummins turbo-charged diesel engine develops 162 hp at 2100 rpm. Standard tire size has been increased to 18:00 x 25, to insure additional traction and flotation. Air brakes are standard on H-90.

Model H-70 has operating capacity of 7000 lb and peak lift of 13,000 lb. Cummins diesel engine develops 124 hp. Both models are available with GMC diesel and H-70 optional power includes an IHC gas engine.—**Frank G. Hough Co.**, 703 Seventh Ave., Libertyville, Ill.

For More Details Circle No. 453—Page 53

CONVEYOR BELT

Super-Hotop conveyor belting will handle materials at temperatures up to 1100° F. It is made of asbestos and cotton in seven to

twelve plies stitched with heat-resistant twine to prevent curling. A special compound is used to coat the belt surface.—**Hettrick Mfg. Co.**, 1401 Summit St., Toledo, Ohio.

For More Details Circle No. 454—Page 53

FACE SHIELD WINDOWS

Multi-Ply face shield windows are said to be extremely heat resistant. In tests, average time required to penetrate the windows

with a propane blowtorch flame was 15 seconds as compared with 7 seconds for ordinary cellulose acetate. The windows are available in six types featuring fiberglass crowns and shells. Headgear is nylanite with a pivoting cross band, adjustable for height, and an offset cambered rear headband.—**Chicago Eye Shield Co.**, 2727 W. Roscoe St., Chicago 18, Ill.

For More Details Circle No. 455—Page 53

SWING-FRAME CUTOFF

Swing-frame feature has been added to the company's line of cutoff machines and will permit cutting of all alloy steel, ductile iron, and other foundry metals. It is available as standard equipment on all Tabor-Brasive cutoff machines of table-type design and is said to provide savings in equipment, space, and maintenance.—**Tabor Mfg. Co.**, division of Turbo Machine Co., Lansdale, Pa.

For More Details Circle No. 456—Page 53

EPOXY COMPOUND

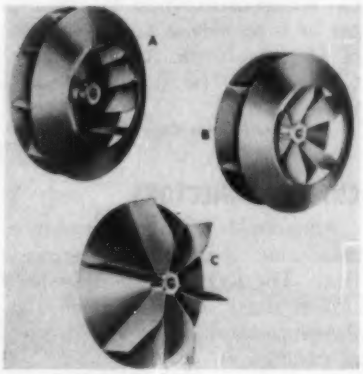
Economical epoxy compound is for tooling and repairing. Devcon 100 is a puttylike material, and Devcon 101 is a liquid. Both are said to have good tensile and compressive strength, resist most chemicals and oils, and bond to all types of metals, wood, ceramics, etc. Compound is used for foundry patterns and coreboxes and is stocked in gallon, 5-gallon, and drum quantities.—**Devcon Corp.**, Danvers, Mass.

For More Details Circle No. 457—Page 53

INDUSTRIAL FANS

Fans to exhaust gases and corrosive fumes and to handle granular or fibrous materials are available in three blade shapes, a wide range of wheel and inlet sizes, and five arrangements to meet most requirements. Blades, illustrated, are as follows: A. Air or gas handling wheel for welding booths, ovens, dryers, and incinerators. B. Granular-conveying wheel, with straight blades to resist abrasive action and wear, used to convey foundry sand. C. Long-strand handling wheel which permits stringy or fibrous materials to pass through the fan.

Blades are designed to be repaired or replaced with common utility



tools. Wheels are electronically balanced, and fan shafts are machined to close tolerance.—**Trane Co.**, LaCrosse, Wis.

For More Details Circle No. 458—Page 53

PORTABLE HARDNESS TESTER

Penetrascope portable hardness tester can record Vickers hardness numbers of 150-1100 on either curved or flat surfaces. Unit is held by an electromagnetic clamp with four pole pieces, two of which can be adjusted to accommodate different degrees of curvature. Tests can be made in grooves with minimum width of 2 in. and to depths of 7 in. Standard loads up to 30 kg are applied manually by a hydraulic unit.

Indentor is a standard 136-degree pyramid-shaped diamond. Unit has a $3\frac{1}{2}$-in. objective and an indentor fitted to a sliding turret, remotely controlled from the instrument. Measurement is made with an optical indicating micrometer with an accuracy of ± 0.001 mm. Standard model is designed to operate on 110/240 v and 40/60 cycle a.c.—**Steel City Testing Machines Inc.**, 8817 Lyndon Ave., Detroit 38, Mich.

For More Details Circle No. 459—Page 53

SPECTROPHOTOMETER

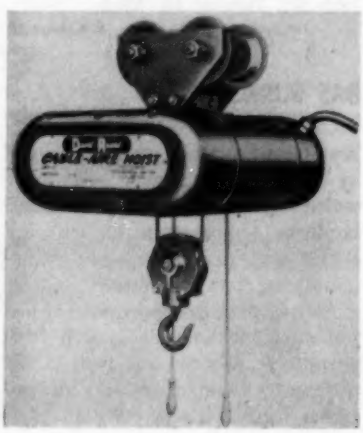
Infrared double-beam spectrophotometer, Model NK-1, with automatic scan control and continuously accelerated scan speeds, is able to scan 2-16 microns in 4 min. Unit can be used with a variety of accessories to broaden its capabilities. Available attachments allow wavelengths from 0.2 to 38 microns.—**Spectrochemical Div., Baird-Atomic Inc.**, 33 University Rd., Cambridge 38, Mass.

For More Details Circle No. 460—Page 53

CABLE-TYPE AIR HOIST

Cable-Aire hoist allows hoisting close to overhead supports and close approach to walls and building structures. Powered by a rotary vane, explosion-proof air motor, the hoist reportedly is protected against burnout from overload. Control valve automatically returns to neutral on release of rope pendant. Upper limit safety also returns the control valve to neutral.

Lifts of 20 and 40 ft with variable speeds are offered in capacities from $\frac{1}{4}$ to 2 tons. Three-reduction spur gear mechanism with mechanical load brake is permanently lubricated and is housed in a high-



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All movements hydraulically controlled. Hydraulic unit and electric control panel self-contained, placed for convenience. Cores are ejected by means of a "flip-plate" assembly, which virtually "hands" cores to the operator. At no time does the operator have his hands between the heater plates.

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MOLDING MACHINES • SANDRAMMERS • SHELL MOLD AND CORE MACHINES • COMPLETE SAND HANDLING SYSTEMS

strength aluminum alloy frame. One-piece, steel lug suspension members connect to plain, hand-geared, or air-driven trolley.—**David Round & Son Inc.**, Box 198, Cleveland 39, Ohio.

For More Details Circle No. 461—Page 53

SMALL FURNACES

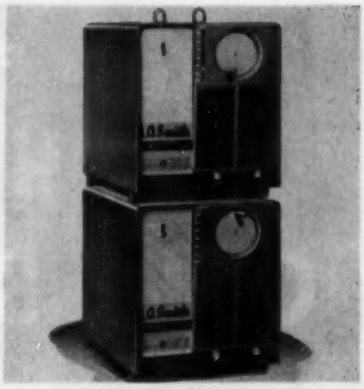
Dyna-Trol furnaces, designed for special use in laboratories, heat up to 2000° F in 1 hr and to 2300° F in 1½ hr. A constant level of temperature can be maintained by input controllers, which can be set at 7 to 100 per cent of input. Zone gradient control operates by multiple circuits, with each circuit having its own input controller. Gradients are indicated by a pyrometer and two thermocouples, located zonewise, and a thermocouple selector switch.

Elements are supported by holders which are said to provide excellent heat transfer properties. A low mass characteristic keeps overshoot and undershoot of temperature control point to a minimum. Models range from 18-24 in. high, 18-24 in. wide, and 18-72 in deep. Other models are 6 x 6 x 18 in. Each unit is equipped with forced convection fans which operate to 1875° F and can be removed for operation above that.—**L & L Mfg. Co.**, 804 Mulberry St., Upland, Chester, Pa.

For More Details Circle No. 462—Page 53

WELDING MACHINES

Premier line of standard ac welding machines features lateral coil movement to reduce cabinet height without increasing floor space. Machines can be stacked (up to three



units high), and handwheel adjustment of current is easy because gravitational force on the moving coil is eliminated. A one-sided brake is said to end coil creep.

The welders have handwheel-to-floor distance of 19¾ in. Improved turning ratio reportedly cuts total handwheel turns.—**A. O. Smith Corp., Welding Products Div.**, 3533 N. 27th St., Milwaukee 1, Wis.

For More Details Circle No. 463—Page 53

LIMIT SWITCHES

Line of limit switches is designed for use on high-speed, precision production machines. Each switch is sealed externally at the operating shaft bearing and between cover plate and contact assembly. Internal seal is between the operating head and switch base. Contacts are enclosed, but visible.

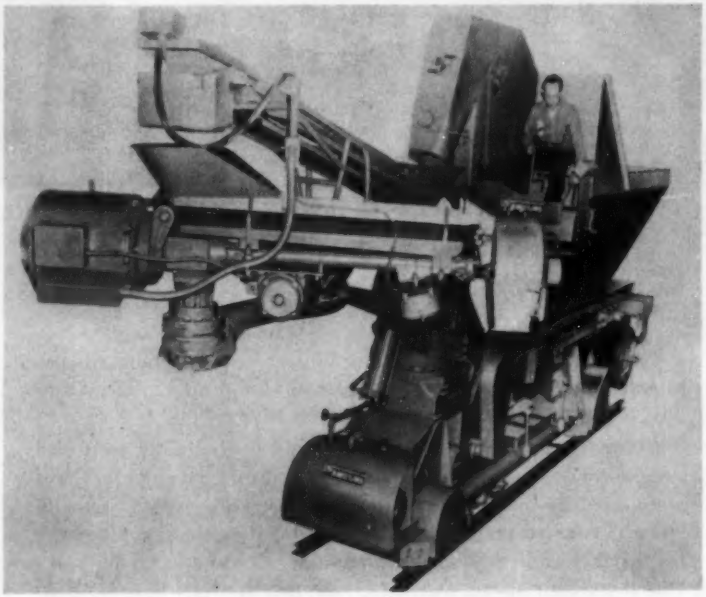
Switches are available in surface type and flush type mountings and are calibrated to control tolerances for identical operation of all switches. Parts and assemblies can be interchanged from one switch to another. Fourteen different operating heads are available. They can be mounted in any of four positions, 90 degrees apart. Rotary levers can be positioned anywhere through a 360-degree circle.—**Cutler-Hammer Inc.**, 244 N. 12th St., Milwaukee, Wis.

For More Details Circle No. 464—Page 53

PNEUMATIC RAPPERS

Air Rappers for electrostatic precipitators and dust collectors are made with a patented one-piece design to reduce maintenance problems. Rappers have no assembly bolts to stretch and shear and no separate striking plate to leak air from the housing. Exhaust parts on both sides of the housing keep the

Slinger Combines Mobility and Productivity



Motive Hydra-Slinger combines the productivity of a stationary slinger with the mobility and flexibility of a motive type. Up to 50 per cent greater ramming capacity is claimed for unit over company's motive slinger. Reduced operator fatigue also is claimed to result in greater accuracy and mold production.

Features of the new unit are precise ramming head control, rugged construction with specially designed raising and lowering arms, pushbutton sand volume control, centrally located control station for optimum visibility, and Protect-O-Mag feature which affords effective separation of tramp iron.—**Beardsley & Piper**, division of Pettibone Mulliken Corp., 2424 N. Cicero Ave., Chicago 39, Ill.

For More Details Circle No. 484—Page 53

Circle 604 on Page 53→

Fluid Power news

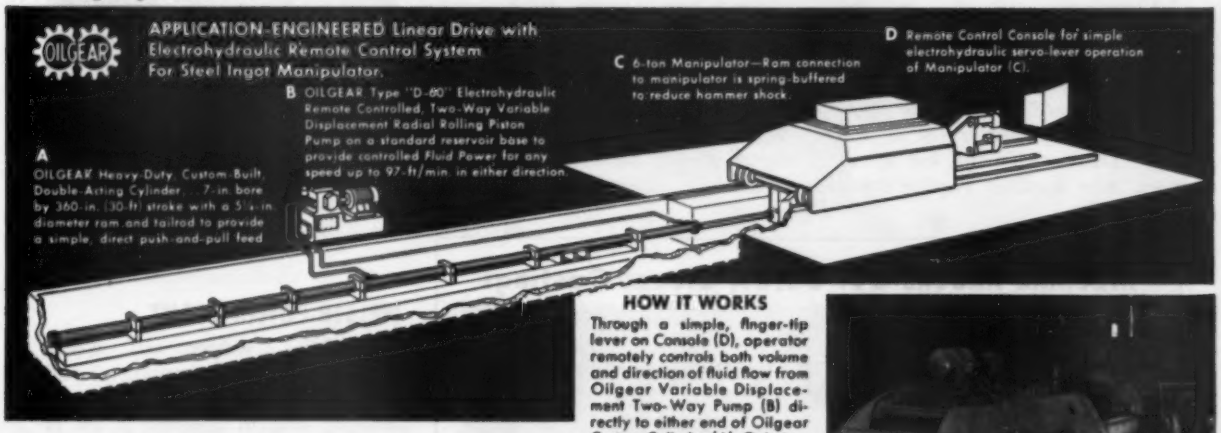
REPORT NO. 11,801 REMOTE CONTROLLED INGOT MANIPULATOR

From Oilgear *Application-Engineering* Files

HOW OILGEAR DRIVE SYSTEM ON INGOT MANIPULATOR IMPROVES CONTROL—CUTS DOWNTIME

DATA: Replace an electric variable speed drive on a 6-ton ingot manipulator because of excessive maintenance downtime, high rebuilding and replacement costs. Initial replacement plans called for a hydraulic variable speed drive directly to manipulator wheels, retaining customary practice of operators riding on manipulator. A job study revealed that while feeding an ingot under the open frame steam hammer, forward motion is momentarily stopped by each hammer impact—frequently bouncing manipulator wheels in the air, causing traction, speed control, shock, and operator fatigue problems.

Basic Manipulator Drive Requirements were re-evaluated as follows: 1. Remove drive from manipulator to reduce shock-provoked maintenance downtime. **2.** Drive to be independent of wheel traction to improve feed and control. **3.** Provide stepless, remote speed control from zero to maximum in both directions. **4.** Withstand severe shock, vibration, heat, and dust on a continuous 16-hour day basis. **5.** Reduce operating, maintenance, and installation costs. **6.** Provide for future incorporation of hammer control with remote manipulator console.


APPLICATION-ENGINEERED Linear Drive with Electrohydraulic Remote Control System For Steel Ingot Manipulator.
A OILGEAR Heavy-Duty, Custom-Built, Double-Acting Cylinder . . . 7-in. bore by 360-in. (30-ft) stroke with a 5¼-in. diameter ram and tailrod to provide a simple, direct push-and-pull feed
B OILGEAR Type "D-60" Electrohydraulic Remote Controlled, Two-Way Variable Displacement Radial Rolling Piston Pump on a standard reservoir base to provide controlled Fluid Power for any speed up to 97-ft/min. in either direction.
C 6-ton Manipulator—Ram connection to manipulator is spring-buffered to reduce hammer shock.
D Remote Control Console for simple electrohydraulic servo-lever operation of Manipulator (C).

HOW IT WORKS

Through a simple, finger-tip lever on Console (D), operator remotely controls both volume and direction of fluid flow from Oilgear Variable Displacement Two-Way Pump (B) directly to either end of Oilgear Custom Cylinder (A). Only two pipe lines are required. Power input is used only in proportion to work performed, as no pump output power is wasted in direction control valves, external relief valves, flow control valves, auxiliary components, or excessive piping. Stepless, infinitely variable, smooth, steady manipulator speeds are instantly available in either direction. Fluid flow and pressure decelerate to zero as flow direction is changed—flow and pressure then accelerate to any selected amount in the new direction . . . reversal is smooth-cushioned — shock is eliminated. Controlled acceleration and deceleration; hydrodynamic braking; automatic pressure and flood lubrication; continuous filtration of power fluid . . . all are inherent features of Oilgear "Any-Speed" Drive Systems.

Hammer operator indicated. Oilgear-powered Manipulator with 5300-lb ingot.

Manipulator operator indicated. Cut-off of second 9-in. square, 90-in. bloom worked from one ingot.

SOLUTION: An Oilgear Linear Drive and Electrohydraulic Control System as shown above schematically. This departure from customary manipulator drives has proved—*in over two years of operation*—to have the following advantages: **1.** Lower operating costs . . . previous manipulator averaged 12% to 15% downtime every 16-hour day for repair and adjustment of drive and control components. **2.** Direct push and pull linear drive is a more positive, smoother, shockless feed—NOT affected by variations in wheel traction. **3.** Remote console with simple electrohydraulic servo control eliminates operator discomfort and fatigue. **4.** Cylinder is protected below floor—"Power-Pak" is mounted away from heat and dust of work area. **5.** Constant, automatic overload protection insures longer life, prevents damage.

System was selected due to Oilgear's reputation for trouble-free reliability, long life, simplicity, and on-the-job-proved performance of the following *Oilgear-Powered* equipment in this user's plants . . . 300-ton ingot strippers . . . large forming presses . . . tube pointing presses . . . hydrostatic testers . . . stripping presses . . . pipe benders . . . seamless steel tube piercers . . . planers . . . cut-off machines . . . tube threaders—operating efficiently—in constant, daily use—some have been in service for more than 20 years.

User Reports—" . . . well pleased with the steady feed rate at both low and high speeds . . . we'll go to this type of drive when we rebuild or require another Manipulator."

For accurately controlled linear or rotary power—for the lowest cost per year . . . check with Oilgear!

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vibrator piston centered. Units can be arranged with a solenoid valve and timer for automatic control.

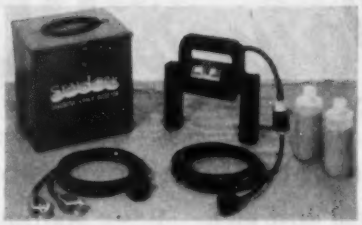
Rappers are made for vertical or horizontal mounting and measure 10½ in. long x 5 in. wide x 9¾ in. high. They weigh 52 lb. Air consumption at 50 psi is 9 cfm.—**National Air Vibrator Co.**, 435 Literary Rd., Cleveland 13, Ohio.

For More Details Circle No. 465—Page 53

CRACK DETECTOR

Model S-20 Seal-Lock magnetic crack detector is claimed to be capable of finding surface or subsurface cracks, flaws, or defects in any ferromagnetic metal. It is reported to have detected flaws as deep as ½ in. below the surface.

Completely portable, the unit weighs 30 lb and can be operated from a 110-v ac source or from an ordinary truck or auto battery. Units also are available for operation from any other ac or dc voltage. Detectors are for use by one man, who does not require special



training. Based on the magnetic particle inspection method, they provide uniform results. Complete unit includes probe, connectors, sprinkling bulbs, gray and yellow powder, and a steel carrying case.—**United States Casting Repair Corp.**, 6432 Edmund St., Philadelphia 35, Pa.

For More Details Circle No. 466—Page 53

ALUMINUM PIG

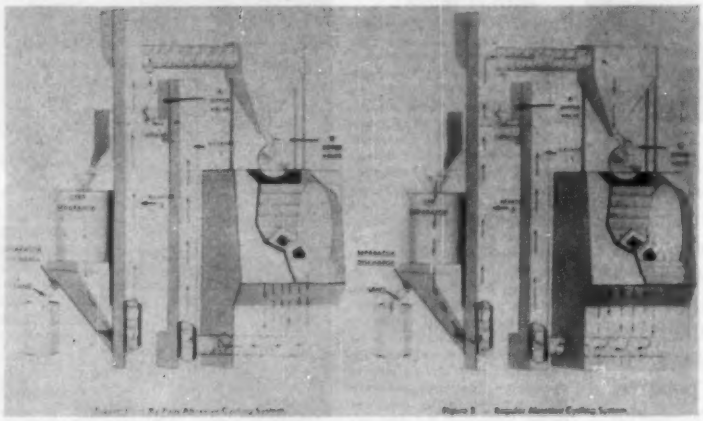
Redesigned standard 50-lb aluminum pig is cast with a side-by-side interlocking notch which holds pigs securely in place. In addition, a flat, sloping side permits better fitting in bundles, which are bound with four metal straps. Bundles also can be ordered for shipment covered with polyethylene bags if desired.

The 50-lb pigs are available in two different bundles, the standard 2200-lb type, cross-stacked and made up of 44 pigs, and a new low-silhouette, parallel-stacked 2350-lb bundle 30 in. high. The latter contains 47 pigs and is prepared for users who charge whole bundles in small furnace-door openings. The standard type is designed for fork

truck handling and is stable enough for transfer with crane and slings.—**Aluminum Co. of America**, 740 Alcoa Bldg., Pittsburgh 19, Pa.

For More Details Circle No. 467—Page 53

Machine Knocks Out Cores, Cleans Castings



Single machine for core knockout and blast cleaning features CFR Separator to separate sand from the abrasive operating mixture. Consisting of two main cycles, the operation is controlled by a timer which permits variable time setting for the various phases.

To start the core knockout cycle, castings are loaded into the unit and tumbled for a predetermined time. Any sand remaining is removed by blasting. When valve B opens, all sand and abrasive goes through the separator, where the sand and other contaminants are removed from the abrasive.

The cleaning cycle begins as dipper valve B reopens. The abrasive then runs in a closed system, bypassing the separator as valve A closes. After cleaning, the castings are given a tumble to drain out all abrasive, and they then are unloaded.—**Wheelabrator Corp.**, 1102 S. Byrkit St., Mishawaka, Ind.

For More Details Circle No. 485—Page 53

WELDER-POWER PLANT

AD-225-L welder and power plant is claimed to perform ac and dc welding and metallic inert gas welding and to generate 7 kw of 115/230-v ac power, supply 1 kw of auxiliary 115-v dc power while welding, warm viscous fluids for pumping, thaw frozen pipes, and charge and boost batteries.

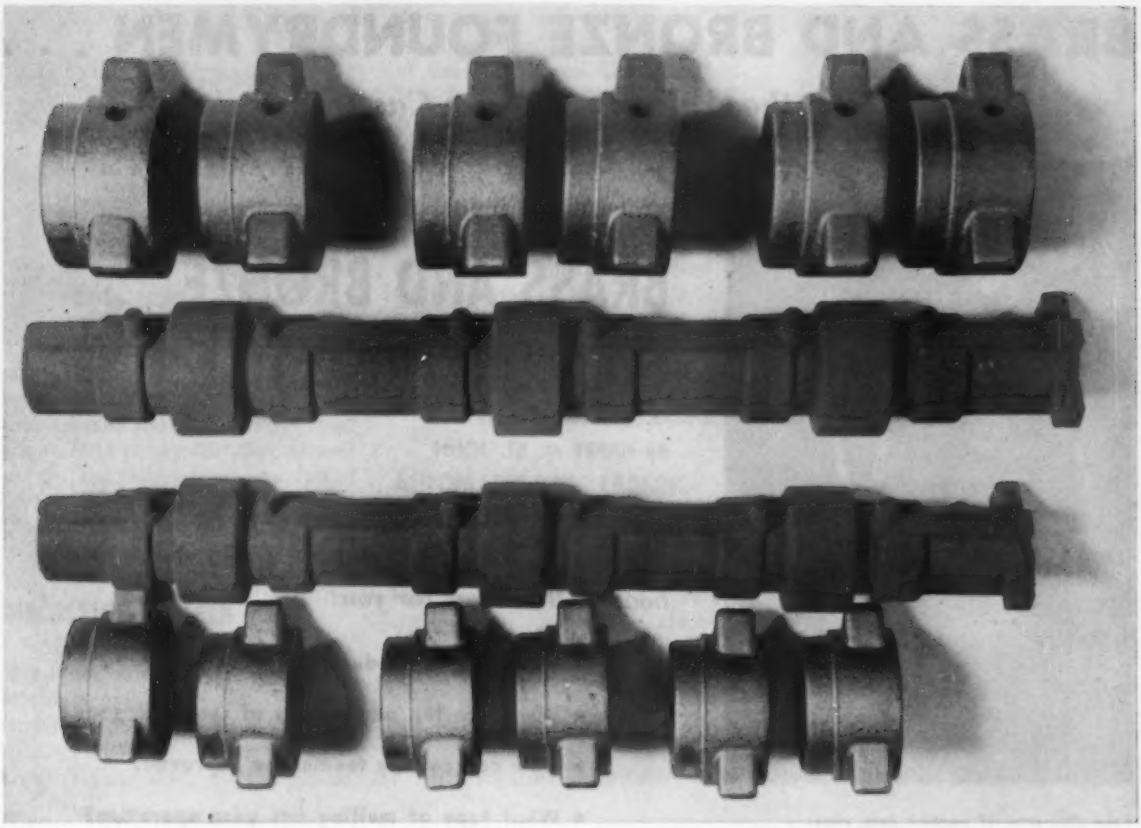
Unit is powered by a 25-hp, 2-cylinder, air-cooled gasoline engine. It is lightweight, and delivers 300 amps at 30 v ac or 225 amps at 30 v dc welding power at 100 per cent duty cycle. Open circuits of 75 v ac and 65 v dc assure good results with ac, dc, or ac-dc electrodes.—**Miller Electric Mfg. Co.**, 718 South Bounds, Appleton, Wis.

For More Details Circle No. 468—Page 53

pH METER

Model 700 pH meter features a large scale, making it easy to read values within 0.02 pH. Model is portable and can be used wherever a standard 115 v ac outlet is available.

Meter has one operating control and a high-output, electronically modulated amplifier, with printed



Look what happens to costs when foundry switches to shell cores made with Durez resins

Lavelle Foundries, Anderson, Indiana, casts such things as pump parts, motor housings, venturi fittings and other parts for gas burners. Small, light, a lot of them are needed to account for a ton of iron.

So scrap losses came high. Or did, until shell cores' quality and accuracy helped cut them down to a minimum. More important, with shell cores made from Durez foundry resins it is possible to find and correct the *causes* of poor castings within a few hours, instead of the days or even weeks often required with sand cores.

And costs tumbled even further when gang cores were employed. It took only two cores to make the 12 castings shown in the photo . . . where, before, eight single cores were set per mold.

Finally, with better finishes, closer tolerances, more uniform wall thickness, Lavelle castings save additional sums for customers. Less machining, fewer secondary operations.

OTHER ADVANTAGES

No need for core dryers, less chance for warpage, uniform heat transfer over entire core surface. Less sand to buy, less to handle. Cores are lighter, tougher, can be stacked in stockpiles.

Write for a copy of *Durez Guide to Shell Molding*. It contains all the very latest data on this cost-cutting method.

DUREZ PLASTICS DIVISION

HOOKER CHEMICAL CORPORATION, 1007 WALCK RD., NORTH TONAWANDA, N. Y.

HOOKER CHEMICALS PLASTICS

Circle 605 on Page 53

BRASS AND BRONZE FOUNDRYMEN . . .

Do You Have the Answers to Your Casting Problems?

You can find them in

BRASS AND BRONZE FOUNDRY PRACTICE

By HARRY M. ST. JOHN

Here are a few of the dozens of questions this book will answer for you:

- **How can you reduce metal loss?**
- **What are the advantages of synthetic sand?**
- **How can casting feeding be improved?**
- **What type of melting fits your operation?**
- **Which molding method should you use?**

Written to simplify and solve the problems of practical foundrymen, this book is the only up-to-date, comprehensive work available on production of brass and bronze castings. The author has a background of many years of experience, most recently as superintendent in charge of the brass foundry at Crane Co. In 1947, he was awarded the William H. McFadden Gold Medal for his many outstanding contributions to the society and the industry. Order your copy today.

Page after page of practical data, cross-indexed for easy reference.

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8. Metal Losses and Balances
9. Gating and Risering
10. Molding Sand
11. Green Sand Molding Practice
12. Other Molding Methods
13. Coremaking Practice
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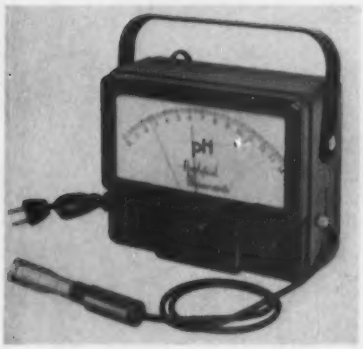
Circle 606 on Page 53



circuitry and sensitive meter elimination. Polyethylene electrode probe unit permits use of the meter anywhere on a production line, as well as in the laboratory.—**Analytical Measurements Inc.**, 585 Main St., Chatham, N. J.

For More Details Circle No. 469—Page 53

DIECASTING PUMPER TUBE

Glasrock pumper tubes used in aluminum low pressure diecasting machines are said to last six times longer than conventional pumper tubes. Advantages reportedly are lower replacement costs, reduced downtime, and elimination of wash, contamination, or oxidation at the metal line.—**Glasrock Products Inc.**, 1101 Glidden St. N.W., Atlanta 18, Ga.

For More Details Circle No. 470—Page 53

BANDSAW BLADE

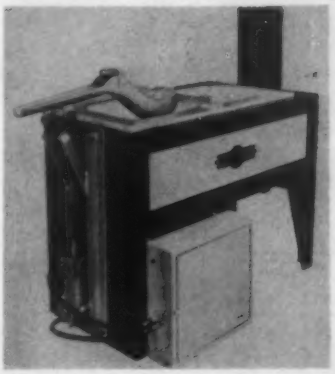
Inscoband hardedge metal cutting bandsaw blade is offered in widths up to 1¼ in. in all standard types and tooth ranges. It is supplied in welded bands or in coils. —**Industrial Sales Co.**, P. O. Box 2399, Buffalo 23, N. Y.

For More Details Circle No. 471—Page 53

AUTOMATIC ZINC LADLING

Automatic ladling preheat furnace maintains correct temperature metal at a predetermined height in the machine pot of any medium-sized zinc diecasting machine. When a lower stainless steel probe is exposed, the ladle device is energized, and metal is added to the pot until the higher probe is covered.

Unit consists of furnace, ladle,



air cylinder, probe holder and probes, liquid level electronic controller, automatic temperature control, and all fixing brackets and connections. The furnace has a capacity of 500 lb and is 28 in. wide by 48 in. long by 30 in. high.—**DCMT Sales Corp.**, 80 Shore Road, Port Washington, N. Y.

For More Details Circle No. 472—Page 53

X-RAY SOURCE

Active element of long-lived source of x-rays in the 100-kv range is composed of Sr-90-Y-90 distrib-

EXECUTIVE REPORT #17

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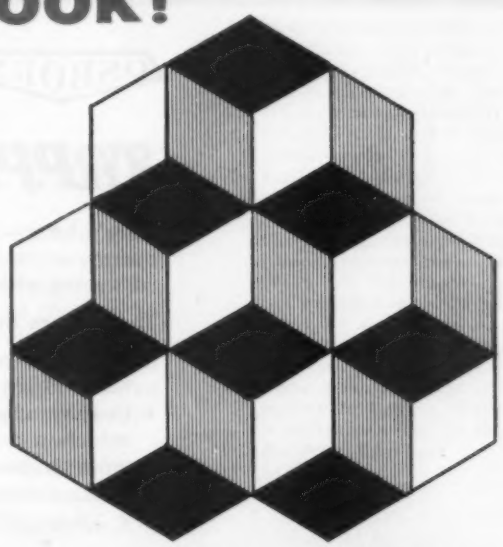
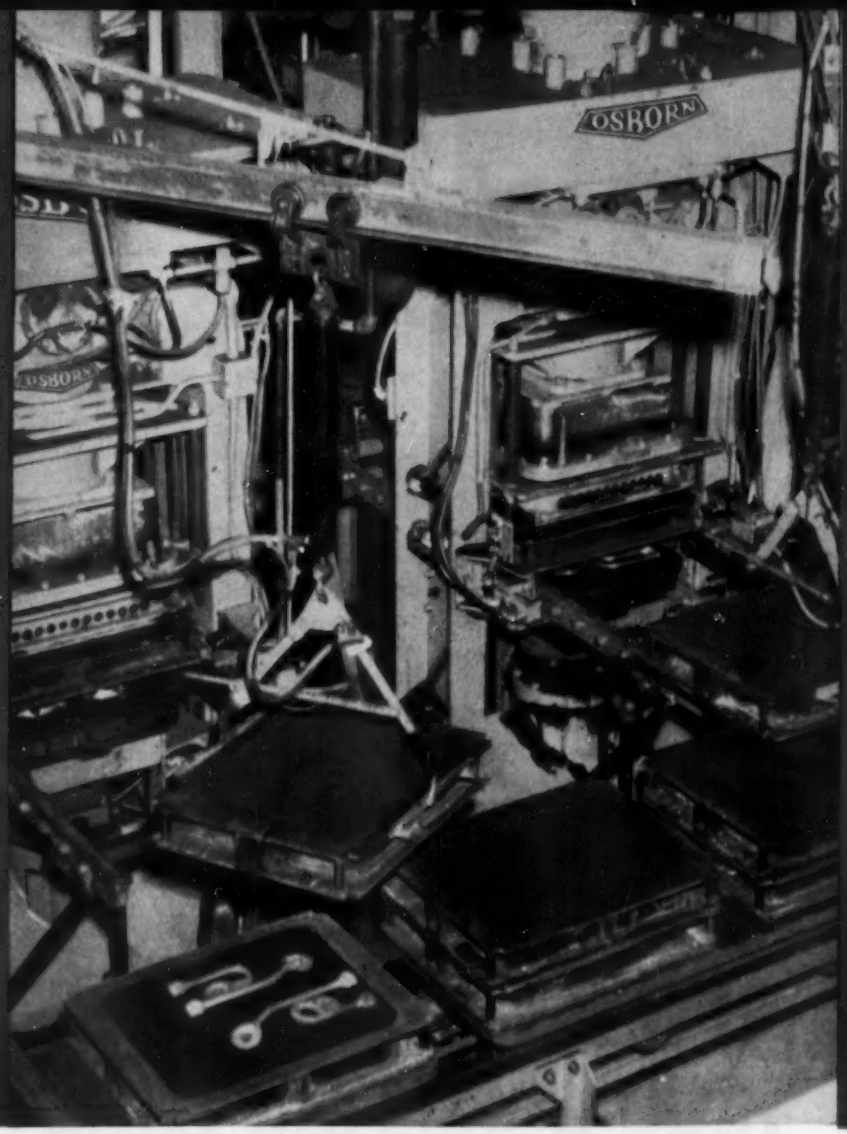


WHEELABRATOR
STEEL ABRASIVES

OSBORN MODEL 19-M. This Series "M" Molding Machine is designed for high-volume production of smaller molds. Series "M" Machines produce superior quality molds which give castings high dimensional accuracy and excellent surface finishes. Tappan uses two Model 19-M machines to blow-squeeze cope molds in the setup shown in the photo at right. Completed copes are swung out on hails and manually closed over drags. Two other Model 19-M machines are used to blow-squeeze drag molds.



OSBORN **FIELD REPORT:** *AUTOMATIC MOLD PRODUCTION AT TAPPAN*

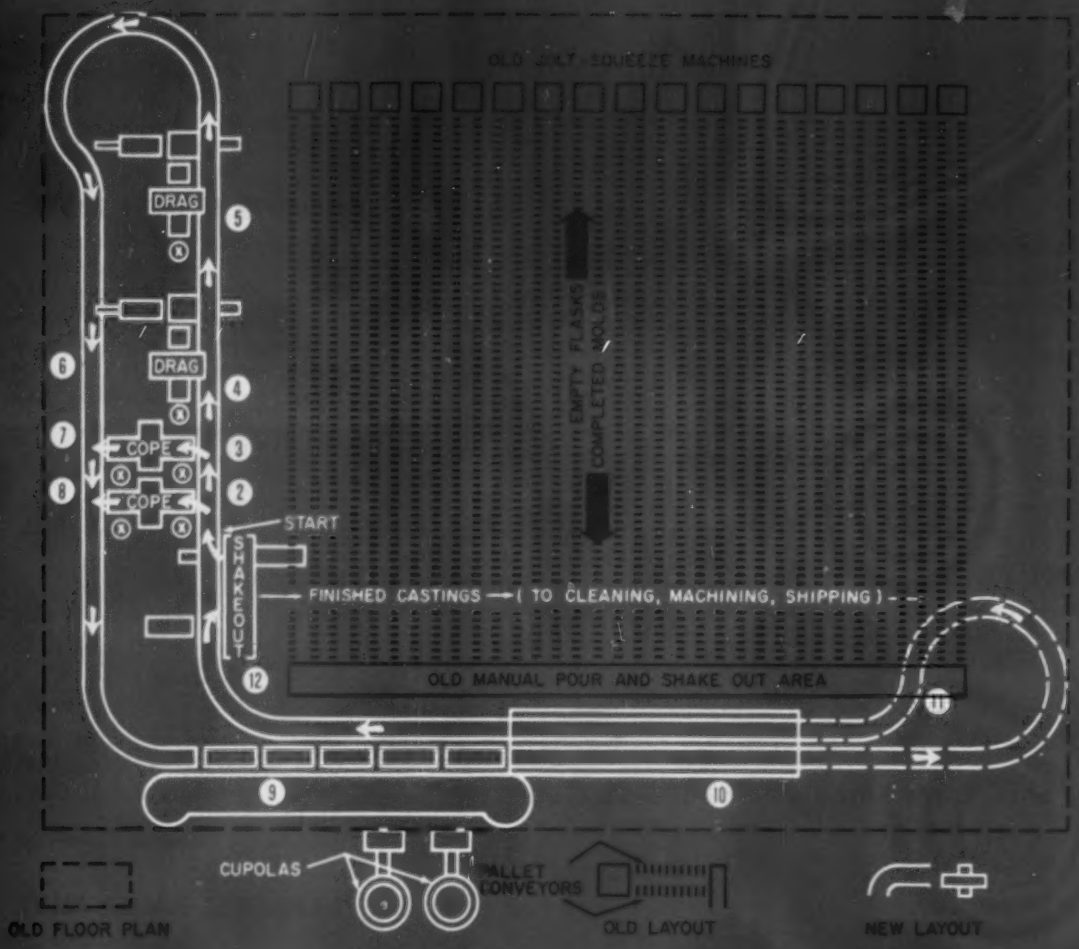
TAPPAN FOUNDRY PRODUCTION

Here's how—When The Tappan Company decided to centralize all foundry operations at their plant in Murray, Kentucky, an engineering study was conducted with the aid of the Osborn foundry engineering staff.

These were the problems

- Production of stove grates and burners had to be doubled to fill the requirements of the Murray plant as well as other Tappan facilities.
- In spite of planned expansion (from 160,000 to 230,000 sq. ft.), a sharp reduction had to be made in the 23,000 sq. ft. allocated to the foundry in order to accommodate growth in other production operations.
- Production costs had to be low enough to offset shipping costs.
- A minimum capital investment was essential in Tappan's plans.

The solution—A completely new layout for semi-automatic foundry operations was developed. Four Osborn Series "M" Molding Machines were installed, replacing seventeen jolt-squeeze machines. Two of these Series "M" Machines are used for cope production, two for drag production. The L-shaped layout (shown above) is enclosed by a 400-foot loop conveyor. Other related operations—cleaning, machining, shipping—are all efficiently located immediately adjacent to the molding line.



HERE'S HOW IT WORKS—The *new* Tappan layout (in white) completely replaces former installation (in black). Empty flasks enter conveyor at "start". At 2 and 3, empty copes are moved into two Series "M" Machines for cope molding. Completed copes are removed at 7 and 8, and closed with finished drags. Empty drags enter two Osborn Series "M" Machines at 4 and 5. Completed drags are automatically transferred, and cores are set at 6. Pouring is done at 9. Conveyor line drops underground at 10 for cooling through 11. Shakeout is performed at 12, completing the closed-loop cycle.

DOUBLES IN HALF THE FLOOR SPACE

The results — Each Osborn Series "M" Machine produces a finished mold within 15 seconds. Extremely rapid Series "M" cycle time amply fills current production requirements . . . with *reserve* capacity for near-future needs. Flexibility of the Series "M" equipment allows patterns to be changed in 5 to 6 minutes. Floor space requirements for the foundry operation were cut to 15,000 sq. ft. Low unit costs now make shipments to Tappan's other plants economically possible. And only minor adaptations will be required to make the installation *fully automatic* for handling even greater future production volume.

Osborn Molding Machines and Core Blowers are *all* engineered to cut costs . . . increase productivity . . . conserve space in production, semi-production and jobbing foundries. Write for full details and technical bulletins for *your* specific applications.

THE OSBORN MANUFACTURING COMPANY

5401 Hamilton Avenue • Cleveland 14, Ohio • ENdicott 1-1900

FEMA

leader in mechanization for the foundry

MOLDING MACHINES • CORE BLOWERS

METAL FINISHING MACHINES . . . and FINISHING METHODS • INDUSTRIAL BRUSHES

Circle 608 on Page 53

uted in a matrix of target material for maximum x-ray production. The source is contained in a doubly sealed stainless steel capsule.—**U. S. Nuclear Corporation**, P. O. Box 208, Burbank, Calif.

For More Details Circle No. 473—Page 53

SILICA CRUCIBLE

Silica crucibles and tubes are added to the company's line of ceramic equipment for testing and handling high temperature metals. Lower cost is said to be the prime feature of this high purity silica apparatus.—**Laboratory Equipment Corp.**, P. O. Box 151, St. Joseph, Mich.

For More Details Circle No. 474—Page 53

CUTTING TORCH

Oxweld C-66 cutting torch uses natural gas to slice through metal up to 30 in. thick with a single pass.

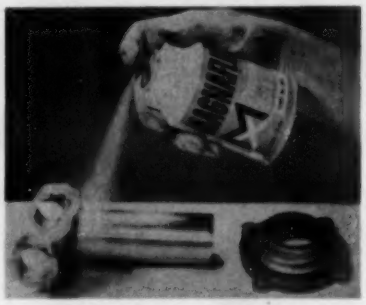
Gas flow is up to 3000 cfh of oxygen and 250 cfh of natural gas through a selection of more than 40 different nozzles for operations including scarfing, gouging, and fin washing. Long, bendable nozzles are available for cutting risers or working in hard to reach places.

The torch weighs 3 lb 14 oz and is 27¼ in. long with 75 degree head angle as standard. Head, body, preheat valves, and cutting oxygen valve are bronze forgings. Tubing is nickel silver, and valve stems have stainless steel ball tips. Plastic packing is claimed to prevent valve stem leakage for the life of the torch.—**Linde Co.**, division of Union Carbide Corp., 270 Park Ave., New York 17, N. Y.

For More Details Circle No. 475—Page 53

MAGNETIC PARTICLE TESTING

Magnaflux - Magnaglo materials are ready to use in hand-sized dispensers. No. 14M fluorescent Magnaglo bath and No. 9BM Magnaflux bath are available in 12 oz pressure spray cans while 1 lb of No. 1 gray powder is offered in plastic



squeeze dispensers. — **Magnaflux Corp.**, a subsidiary of General Mills, 7300 West Lawrence Ave., Chicago 31, Ill.

For More Details Circle No. 476—Page 53

MANGANESE MASTER ALLOY

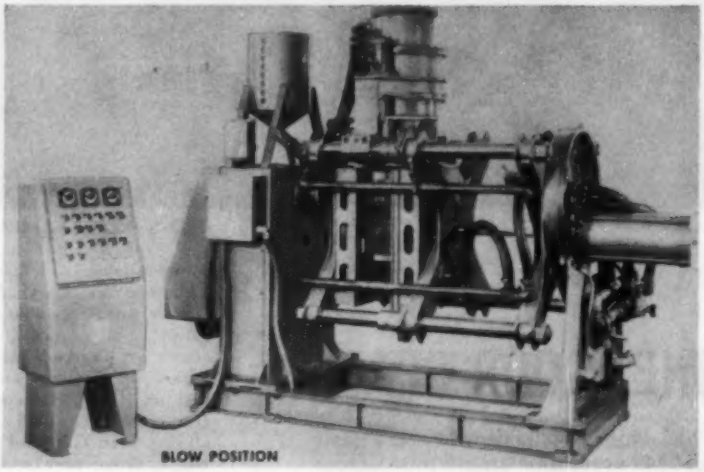
Vancoram alloy is available for adding to aluminum to produce sand, permanent mold, and die castings. Composition of the alloy is 85-90% Mn, 2.0% max Fe, 3.0% max Si, 6.0-7.0% C and 0.050% max P. Iron content can also be limited to 1.0-1.5% max. Alloy is processed to 2 in. by down size and dissolves readily during primary reduction. — **Vanadium Corp. of America**, 430 Lexington Ave., New York, N. Y.

For More Details Circle No. 477—Page 53

PNEUMATIC GRINDERS

Vertical pneumatic grinders are available with a revolving wheel guard for protection and good observation of work. A stationary, adjustable cup wheel guard also is offered. Grinders are designed for grinding, sanding, or wire wheel work. Model 600-V weighs 8½ lb and is available with an air motor which operates at 4500, 6000, or 8000 rpm. Model 700-V weighs 11 lb and is offered with air motor which operates at 4500 or 6000 rpm.

Shell Core Machine Has 100-Lb Capacity



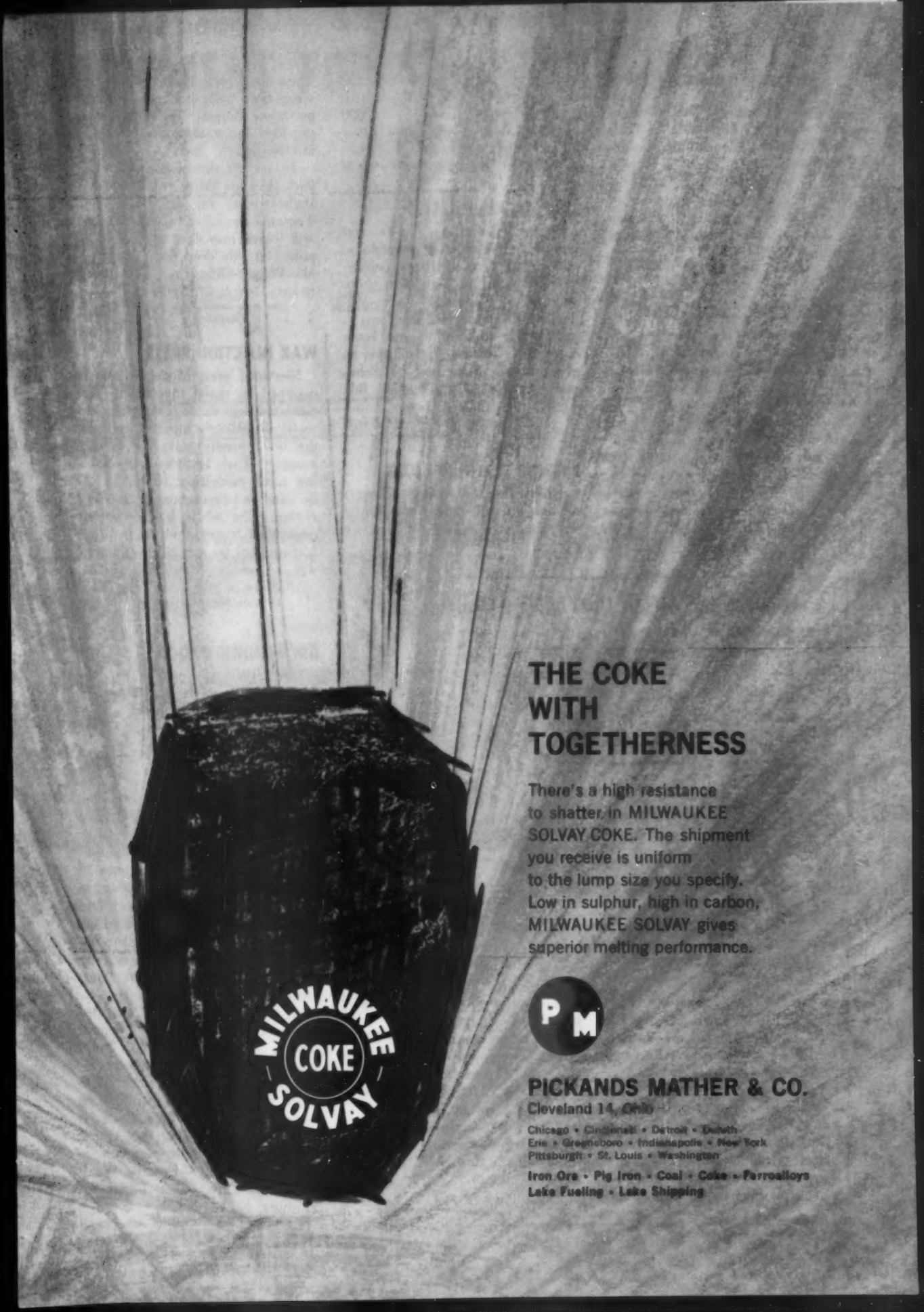
BLOW POSITION

Shell core machine Model SC-100 with 100-lb blow capacity produces large shell cores in single-cavity boxes or medium-sized cores in multi-cavity boxes. Except for core removal, all operations are automatic and variable. Features include gas-fired, thermostat-controlled ovens said to assure accurate temperatures for both contour and solid-back coreboxes and simplified corebox mounting to permit fast, easy change in size or type. Coreboxes up to 24 x 30 x 14 in. are accommodated.

To assure complete drain-out of uncured sand, machine has a variable, three-position drain cycle. From blow position, it can rotate 225 degrees and return 90 degrees to drain sand from horizontal arms in cores. This is in addition to the standard position of 180 degrees rotation.—**SPO Inc.**, 6448 Grand Division Ave., Cleveland 25, Ohio.

For More Details Circle No. 486—Page 53

Circle 609 on Page 53→



THE COKE WITH TOGETHERNESS

There's a high resistance to shatter in MILWAUKEE SOLVAY COKE. The shipment you receive is uniform to the lump size you specify. Low in sulphur, high in carbon, MILWAUKEE SOLVAY gives superior melting performance.

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Both models use a 6-in. wheel or brush, and Model 600-V also can be provided with a 7 or 9-in. depressed center disc wheel. Tools are furnished with a thumb-button control or a roll throttle on the handle grip which operates as the lever is depressed and automatically stops when the lever is released. —**Airetool Mfg. Co.**, 302 S. Center St., Springfield, Ohio.

For More Details Circle No. 478—Page 53

VACUUM DEGASSING UNIT

Vacuum degassing equipment permits continued application of reduced power to an induction furnace during degassing to hold the temperature of the melt. Unit consists of a dome which is placed over an induction furnace, forming an air-tight chamber, and a stationary base-plate containing the ports through which the chamber is evacuated. Besides decreasing gas porosity, the unit is claimed to promote a carbon boil in ferrous metals. Three models are available with capacities ranging from 150 to 3000 lb.—**F. J. Stokes Corp.**, 5500 Tabor Rd., Philadelphia 20, Pa.

For More Details Circle No. 479—Page 53

COPPER-BASE PELLETS

Copper-base alloy brass and bronze pellets make it possible to store, handle, and charge copper-base alloys by means of bins, hoppers, valves, pipes, and feeders. Pellets are said to permit closer analyses, greater uniformity, and fewer checks and controls in addition to providing faster melting.—**I. Schumann & Co.**, 4391 Bradley Rd., Cleveland 9, Ohio.

For More Details Circle No. 480—Page 53

FOLDING STACKING BOXES

Heavy-duty wire boxes have a keyhole locking device and hinges to permit them to be folded flat when not in use. This feature conserves floor space and reduces transportation charges. Rigid support is provided for stacking the boxes to any height.

To set up the boxes, front and back sides are lifted and locked into keyhole slots on the base plate. Then the hinged end sides are raised and locked into slots on the corner posts. A side drop door is optional.—**Palmer-Shile Co.**, 16033 Fullerton, Detroit 27, Mich.

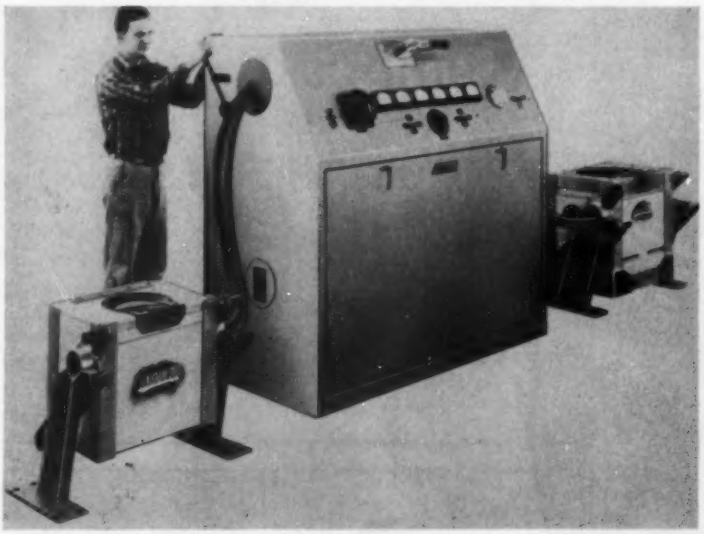
For More Details Circle No. 481—Page 53

WAX INJECTION PRESS

Sherwood press Model WP-60 is designed to make investment patterns for steel castings weighing up to 80 lb. Wax is injected into the die in a mushy state for greater accuracy. Unit features a die-holding table measuring 16 in. by 20 in. and a circulating-oil heating system. The oil is heated by an immersion heater, and temperature is controlled by a capillary thermostat.—**Alexander Saunders & Co.**, 95 Bedford St., New York 14, N. Y.

For More Details Circle No. 482—Page 53

Induction Melting Unit Is Self-Contained



Integral 100 motor-generator powered unit produces 100 kw and is said to be suitable for use with one or two coils or furnaces with capacities up to 500 lb. The console measures only 72 in. wide by 35 in. deep by 66 in. high and houses the power supply, capacitors, control and safety devices. Unit contains an eight-step auto transformer and 30 steps of capacitance values for maximum flexibility in meeting heating or melting needs.

Installation requires only a 60-cycle, 440-v power connection, a cold water connection, and a water drain. Unit is connected to the furnaces by water-cooled leads which contain conductors inside the water-bearing hoses.—**Inductotherm Corp.**, 412 Illinois Ave., Delanco, N. J.

For More Details Circle No. 487—Page 53

ARC WELDING PROCESS

QuenchWeld arc welding process is based on an electrode reported to provide deposits which can be quenched without danger of cracking. Cooling time between welding passes is eliminated. The process is suitable for thin sections or heavy castings. Preheating is eliminated, and peening is not required in most cases.

The first step utilizes a chamfering electrode to vee out the area to be welded and to make grooves to break up stress concentration around the vee. The second step is filling of the grooves and coating the entire weld area with a thin deposit, using EutecTrode 27 sealing electrode, to seal the surface. An electrode called QuenchTrode 24 is used in the third step to provide a deposit low in carbon, alloyed with grain refining elements. This step is completed by backstep welding with beads of 1 to 4 in., depending on section thickness. Each pass is quenched as soon as the arc is broken, and the next pass can be made immediately.—**Eutectic Welding Alloys Corp.**, 40-40 172nd St., Flushing, N. Y.

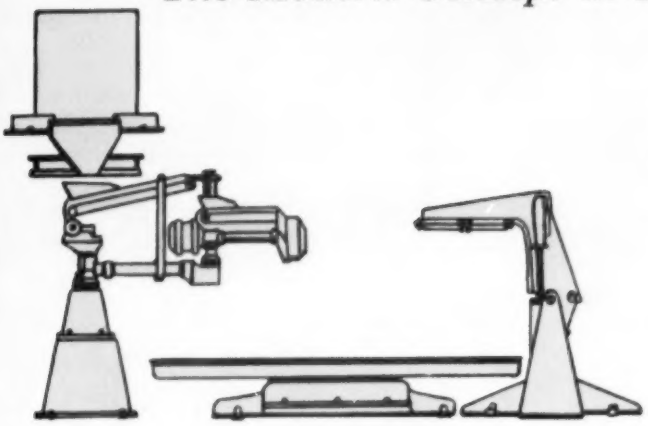
For More Details Circle No. 483—Page 53

Circle 610 on Page 53→

Through Beardsley & Piper Research . . .

EQUIPMENT FOR A GROWING INDUSTRY

The Modern Concept in Molding . . .



HYDRA-MOLD

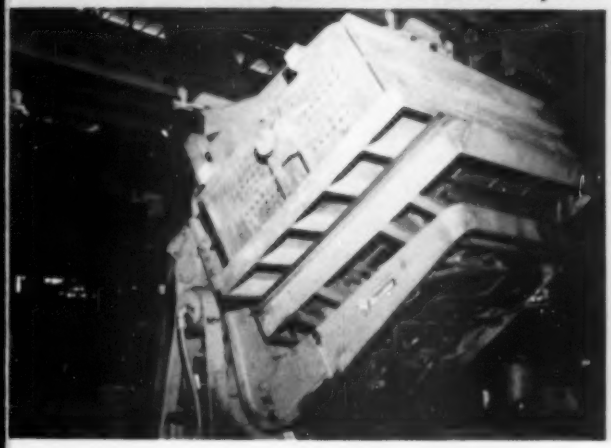
COMPACT. A complete four-station unit requires only 18 x 31 feet of floor space.

FLEXIBLE. The largest Hydra-Mold handles molds and core boxes up to 54″ x 90″, and up to 15,000 pounds in weight—draws to 28″. Instant pattern changes!

PRODUCTIVE. A single Hydra-Mold provides the production of 4 big fully rigged machine stations at a fraction of the installation and operating costs.

Hydra-Mold installations in progressive foundries are described in recent issues of BETTER METHODS. Write directly to B&P for your free copies.

New Standard of Productivity ROL-A-DRAW



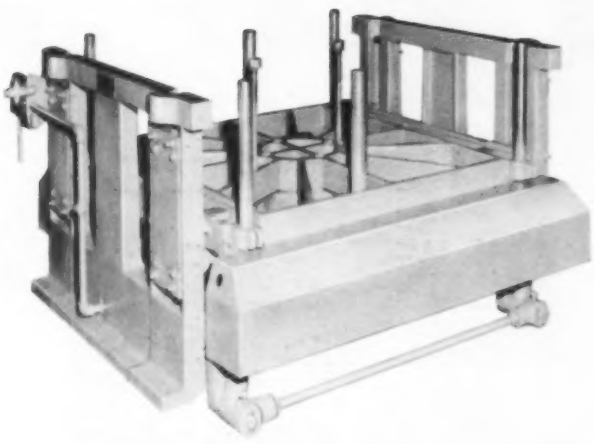
Superbly clean in design, the all-hydraulic Rol-A-Draws are up to three times faster than other rollover-draw units. Time saving Rol-A-Draws are used in a variety of molding and coremaking set-ups . . . with conveyors, transfer cars, turntables, or other devices.

Rol-A-Draws are available in capacities ranging from 1,000 pounds to 15,000 pounds—no pits are required for installation.

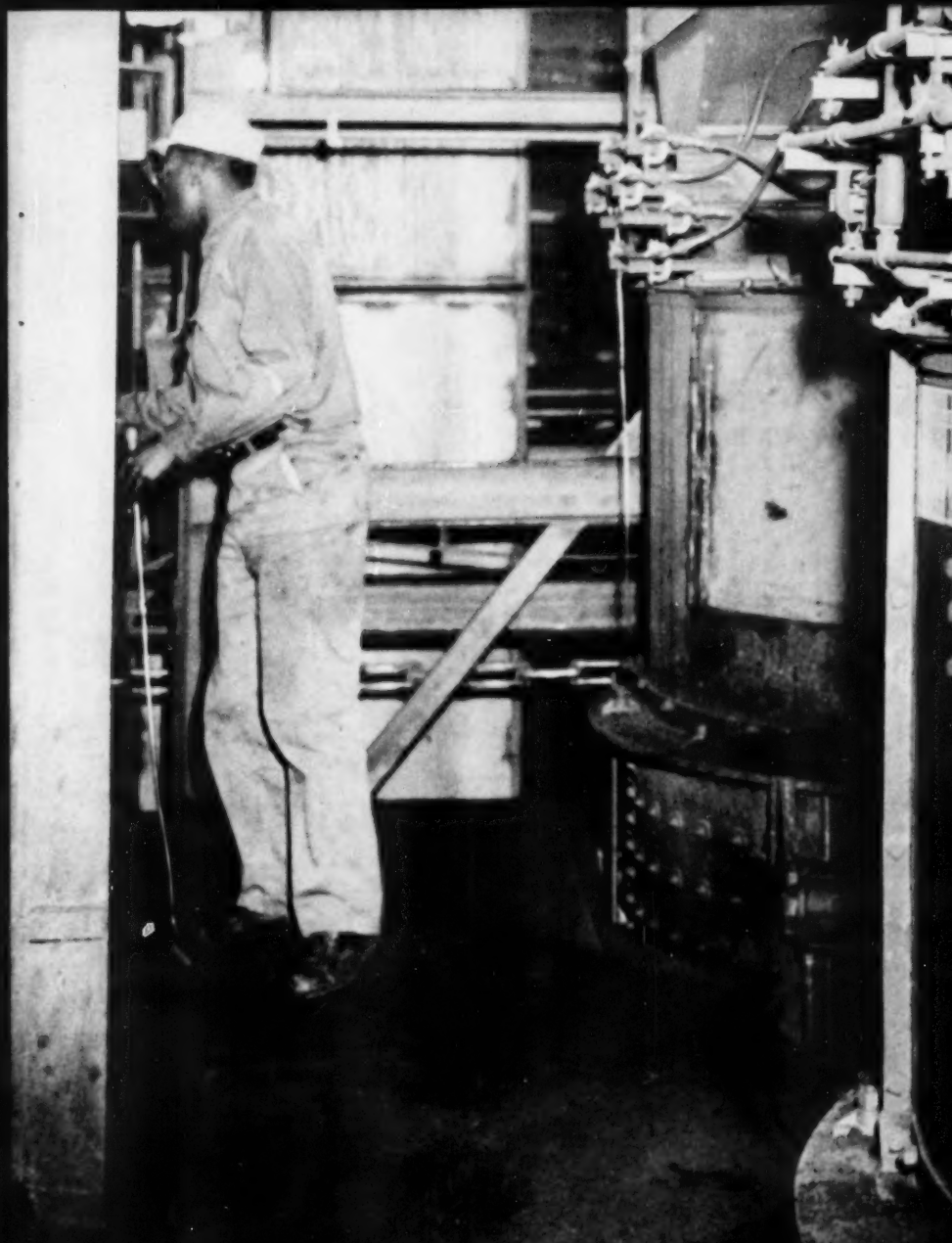
Fast and Accurate

SPEED-DRAW

Perfect joints, accurate draws and uniform castings are assured when a flexible B&P Speed-Draw is used. Each Speed-Draw is quickly adjustable for a wide range of flasks. Low cost, simplified pattern mounting minimizes downtime. Proved performance in hundreds of foundries is your assurance of satisfaction.



◀ USE THIS CARD TO LEARN ABOUT YOUR STAKE IN B & P RESEARCH



ONLY SPEEDMULLOR CAN MEET THE DEMAND FOR CAPACITY AND COOLING

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chose Speedmullor for all sand
tests conducted by AUSCO pro
develops physical properties in
greater hourly capacity.

176 TONS PER HOUR

At AUSCO, four 80A Speedmu
thoroughly mulled and cooled sa
requirements of 4 high-producti
Speedmullor prepares all of AUSC

SPEEDMULLOR COOLING

Outstanding productive efficiency
reused several times per day. Wit
the result: high sand temperatu
thoroughly mull and cool the sa
during a single, short 90 second ov

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proved that Speedmullor *fully*
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mullors provide 176 tons of
sand per hour, meeting the
uction molding lines. A 40A
SCO's core sand.

ncy means that the sand is
With high metal to sand ratios,
ture. AUSCO's Speedmullors
sand from 320°F. to 100°F.
overall cycle.

Sure I'm interested in your research and its results!*
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SPEEDMULLOR USERS REPORT

GREATER PRODUCTIVITY

HIGHER QUALITY

LOWER COSTS

Only Speedmullors meet all the demands of modern cast metal production.

- Most capacity per square foot of floor space.
- Most capacity per dollar invested . . . low initial cost—low operating cost.
- Fully developed physical properties of any sand mixture in short time cycles.
- *Complete* cooling and mulling during a single, short 90 second cycle.
- Dependable performance—minimum maintenance.
- Automatic control of sand preparation by Mulltrolmatic.

That's why today, more foundry sand is mulled in Speedmullors than in any other muller.

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View of molding bay showing high level of illumination at molding stations

GOOD LIGHTING—*Boosts Product Quality*

By J. L. TUGMAN
General Electric Co.
Nela Park, Cleveland

● "FOUNDRY OPERATIONS," says Robert L. Reel of Buckeye Iron & Brass Works, Dayton, Ohio, "always present a challenge to the purpose of making a profit. By their nature, operations put a burden on efficiency in terms of seeing. So we are always hoping to improve seeing conditions with the object of overcoming to some degree the obstacles to good visibility."

Buckeye Iron & Brass Works is a long established company, and the workmanlike appearance of the operations area indicates respect for efficient production methods. Conspicuous in this connection is the specialized lighting for the operators at each molding station. About the lighting Mr. Reel says:

"Early in 1959 we decided to give a big lift to these molding jobs. The tasks are pretty exacting. Quick, accurate inspection of the mold surface to detect flaws or irregularities is required. A well lighted view of the task is the best assurance of accurate core settings. So we provided a solution, at once, simple and effective.

"Our new two-lamp (96 T-12) fluorescent units have delivered values approaching 200 footcandles on details of the work. With lighting of this order it is much easier to get a clear view into the mold. The complex surfaces can be checked far more satisfactorily with superior illumination."

Besides providing workers with a tool that multiplies their effectiveness and improves their morale, there have been substantial production gains from the improved lighting. On this matter Mr. Reel refers to the way his foreman, Paul Gray, appraises the advantages.

"Paul does not claim we are speeding up production but he is pleased with the drop in spoilage and rejected parts. He is happy to have fewer grievances from the men, and this, in part, is an appreciation of the greater safety of the operations. Good quality, diffuse lighting has made a tremendous improvement."

Mr. Reel concludes that the cost of good lighting for these work positions in the molding department has been an excellent investment.

Two-lamp fluorescent units provide nearly 200 footcandles of illumination for machine operators

Industry Briefs

Aluminium Ltd., Montreal, has canceled plans to acquire Apex Smelting Co., Chicago, because of "indicated objections" by the United States Department of Justice. Purchase of Apex for a sum between $11 and $12 million was approved by Apex stockholders four months ago.

Cleveland Crane & Engineering Co., Wickliffe, Ohio, has appointed Cleveland Tramrail Philadelphia Co., 945 S. 53rd St., Philadelphia, Pa., as its representative.

Picker X-Ray Corp., White Plains, N. Y., has been appointed United States agent for nuclear laboratory instruments manufactured by Associated Electrical Industries Ltd., London, England.

Hooker Chemical Corp., Niagara Falls, N. Y., plans to build a plant in northern Kentucky to produce synthetic phenol. It will be constructed on a 165-acre site 3 miles west of South Shore, Ky., and is to be completed by the end of 1961. Durez Plastics Div. will operate the plant.

American Smelting & Refining Co., New York, has named Millard Brass & Copper Co., 823 Albany St., Boston 19, Mass., a distributor for continuous-cast bronze alloys.

Radionics Inc., Lafayette and Water Streets, Norristown, Pa., has been formed to operate in the field of industrial applications of nuclear radiation. Radiation Engineered Services, Norristown, will operate as a division of Radionics. Dr. A. J. Stevens and Louis P. Farrell, former owners of the division, are president and secretary-treasurer, respectively, of the new organization.

Diehl Mfg. Co., Somerville, N. J., has appointed two new sales representatives. William F. Bishop, 203 Walker St. S.W., Atlanta 3, Ga., will cover Georgia and Alabama, and Charles M. Furman Jr. & Associates, 1228 Harding Place, P. O. Box 2624, Charlotte 1, N. C., will handle sales in North Carolina, South Carolina, and Sullivan and Washington counties in Tennessee.

Metal Treating Institute reports billings of $3,835,100 for March, an increase of 17.1 per cent over March, 1959.

General Casting Corp., Peekskill, N. Y., has purchased National Precision Casting Corp., Paoli, Pa., formerly a subsidiary of Beryllium Corp. The new division will continue to operate as before.

Chester Foundries Inc. plans to establish an aluminum castings foundry at 118 Hudson St., Chester, S. C. The firm, which supplies special forms for the rubber industry, will employ about 15 persons at first.

Black & Decker Mfg. Co., Towson, Md., has announced that the entire capital stock of DeWalt Inc., Lancaster, Pa., a subsidiary of American Machine & Foundry Co., is to be transferred to Black & Decker for 120,000 shares of Black & Decker stock. DeWalt policies and management will remain the same.

American Emery Wheel Works, Providence, R. I., has moved its Detroit district offices and warehouse to Warren, Mich. Earl Haden is supervisor.

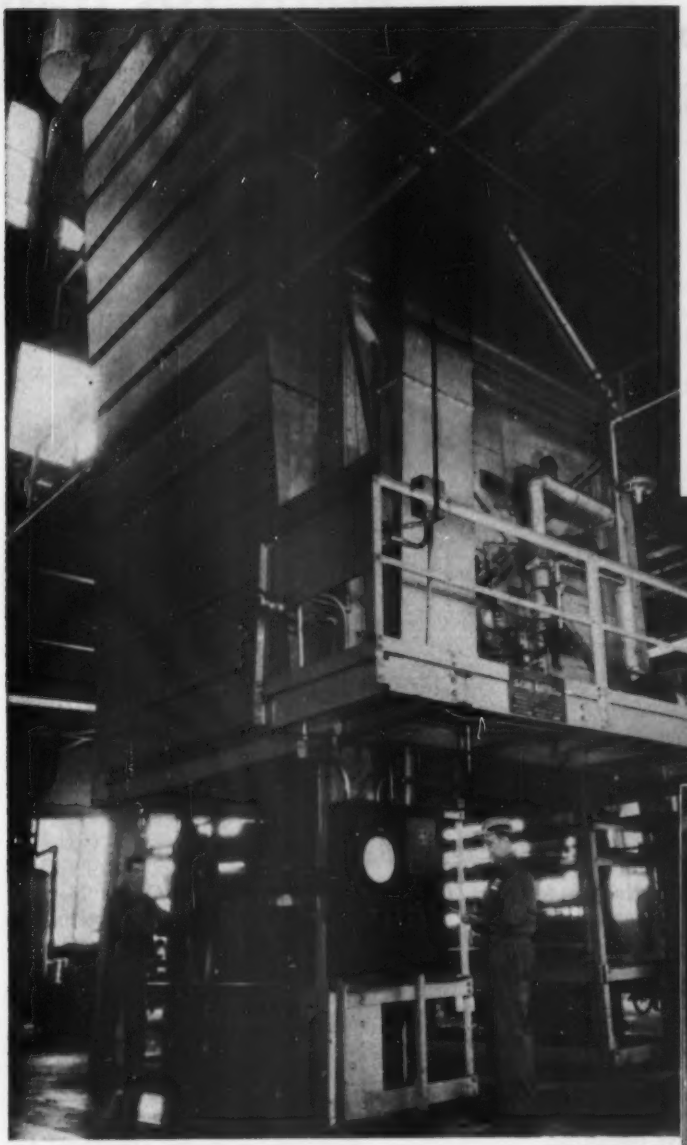
Bausch & Lomb Optical Co., Rochester, N. Y., has changed its name to Bausch & Lomb Inc. to recognize that the company no longer restricts its research and manufacturing to optics alone.

Kutztown Foundry & Machine Corp., Kutztown, Pa., celebrated the official opening of its new office building on May 21 when it was

DISTINGUISHED VISITOR: Dr. Gunther Schwietzke of J. G. Schwietzke Metallwerke in Dusseldorf, Germany, president of the German foundry technical association, observes the pouring of a small centrifugal casting at Wisconsin Centrifugal Foundry Inc. with company vice president and works manager, Paul Schneider. The German company makes centrifugal and continuous castings

Foundry-Proven Money Makers!

Ovens Designed by carl mayer CORP.



The Carl Mayer Corp. experience in engineering and designing industrial ovens and furnaces is second to none! Carl Mayer ovens incorporate recirculating heating systems with sealed combustion chambers and automatic temperature controls for all fuels. Cores and molds are evenly baked faster, with less fuel consumption.

Many foundries of all sizes have found it pays to install Carl Mayer ovens—Our engineers will be glad to work with you on your oven problems. Write or call now!

A NEW VERTICAL CORE OVEN Installed at Forest City Foundry, Cleveland, Ohio. Size is 12' 7" x 11' 10" x 57' 8" high above floor. 29 carriers, 3 shelves high; each shelf 30 x 106 inches. Features forced cooling and exhaust system for uniform cooling of cores before unloading.

CAR TYPE MOLD OVEN at American Brake Shoe Co. features under floor chain car puller. Size 10' x 10' x 19' long.

THE carl mayer CORP.

20800 CENTER RIDGE ROAD CLEVELAND 16, OHIO

OTHER PRODUCTS: Heat Treating Ovens and Furnaces • Rod Bakers • Welding Rod Ovens • Paint and Ceramic Drying Ovens • Special Processing Equipment and Accessories

Circle 611 on Page 53

HOW To Do It

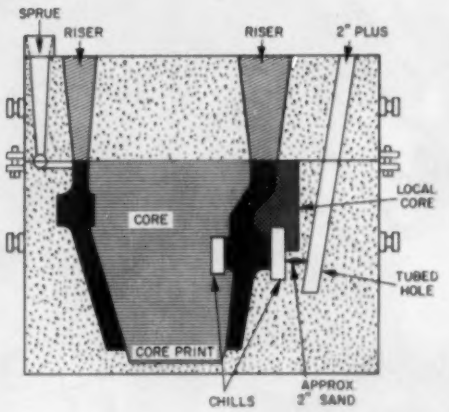
FOUNDRY will pay a minimum of $15 for each "How To Do It" idea submitted and published

Water-cooled Chills Promote Sound Metal in Heavy Casting Sections

By L. H. AKERMAN
Foundry Foreman
Kent Alloys Co.
Rochester, Kent, England

HEAVY BOSSES occasionally are situated on castings at spots which may not be accessible to proper feeding. In some instances also the application of chills may not be enough to promote solidification of a solid section. A metallurgically sound casting may be obtained in these cases by using a water-cooled chill.

The sketch shows the method. A hole is tubed down from the top of the mold to the area behind a chill, allowing about 2 in. of sand between chill and hole. A few seconds after the mold is poured and the metal begins to solidify, water is poured down the hole. The excess moisture conducts heat away from the chill.



The method is particularly effective for quick freezing alloys such as special or stainless steels, aircraft aluminum, or copper-base alloys.

host to 2500 persons at an open house. The new building includes reception lobby, executive, sales, and purchasing offices, accounting and billing department, conference room, and kitchen.

Radiation Engineered Services, division of Radionics Inc., Norristown, Pa., has sold what is said to be the largest cobalt 60 gamma radiography facility ever built on this continent to Quaker Alloy Casting Co., Myerstown, Pa. The unit contains 1400 curies of cobalt 60 and is capable of radiographing an 8-in. thick section of steel in five minutes.

Denver Fire Clay Co., Denver, Colo., and Salt Lake City, Utah, will market Babcock & Wilcox Co. refractories products in Colorado, Wyoming, New Mexico, Utah, eastern Nevada, Idaho, and western Montana.

S. G. Taylor Chain Co., Hammond, Ind., has appointed Jessen & Gundry Inc., Seattle and Portland, as representative in Washington and Oregon.

Deynor Corp., Mamaroneck, N. Y., has appointed M. A. Bell Co., St. Louis and Houston, as sales representative for Veriwet cartridges and Multiwet wetting compounds. M. A. Bell Co. will serve Iowa, Nebraska, Kansas, Missouri, Oklahoma, Arkansas, Louisiana, and Texas.

Ervin W. Brudnicki & Associates, 675 Winston Dr., Melrose Park, Ill., are now accepting international consulting assignments in zinc, aluminum, and magnesium functional and decorative diecasting.

Hydrodyne Industries Inc., 500 Shames Dr., Westbury, L. I., N. Y., has introduced a complete line of hydraulic piston accumulators for use in foundries. Accumulators are available in capacities from 10 cu in. to 23 gal, pressures up to 10,000 psi, and temperatures up to 400° F.

National Malleable & Steel Castings Co., Cleveland, has acquired Hill, Hubbell & Co., division of General Pacific Corp., Cleveland, for approximately $3 million. The new wholly owned subsidiary applies protective coatings to pipe and has plants in Youngstown and Lorain, Ohio; Denver; Hammond, Ind.; and Napa, Calif.

Barth Smelting Corp., Newark, N. J., producer of brass and bronze ingots and other nonferrous metals, has appointed Klein-Farris Co., Boston, as sales agent for its smelter products in New England.

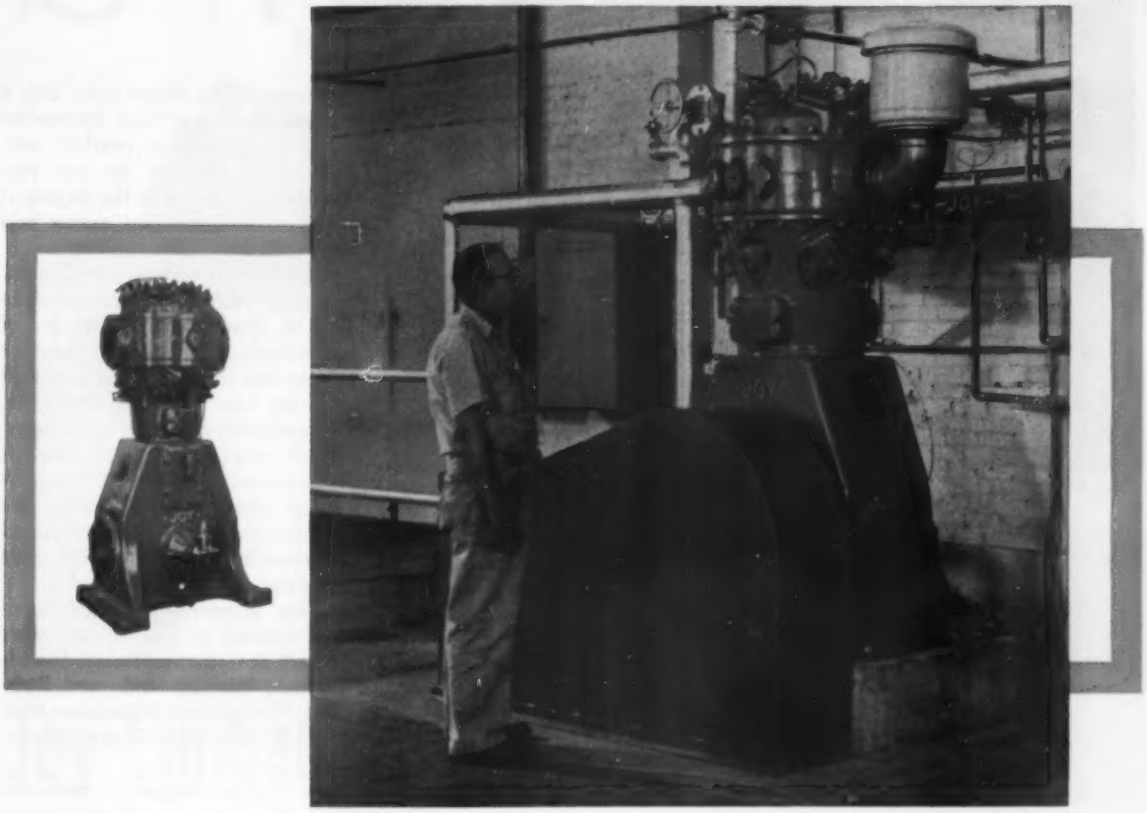
Book Review

Praktische Ratschlaege fuer den Giesserei-Fachmann **(Practical Advice for the Foundry Expert) by F. Naumann, paper, 110 pages, 5¾ x 8¼ in., published by Fachverlag Scheile & Schoen GmbH, Berlin, Germany. Price 7.50 DM.**

This German second revised edition provides 50 selected examples of foundry practices intended to help even the experienced foundryman to avoid difficulties that result in defective castings. Numerous sketches and illustrations accompany the concise but clear explanations of the various procedures which relate to molding, coremaking, etc.

Now Available Up To 150 HP

NEW JOY WG9H VERTICAL COMPRESSORS



Joy's line of highly efficient vertical type compressors has been extended to 150 hp. These new heavy duty WG9H's have the same design features which established the vertical type, single-cylinder compressor's reputation for high efficiency and low maintenance.

You can get both standard and oil-free machines in six standard atmospheric air sizes, with appropriate cylinders for gas boosting and high pressure applications, if desired. Capacity range is from 633 to 1630 cfm.

Other Joy vertical type compressors are available in a range from 15 to 75 hp. Joy also can furnish V-type and semi-radial type machines up to 1250 hp, and axial or centrifugal compressors from 15 to 15,000 hp. Whatever your air or gas compressing problems may be, Joy can supply an economical solution.

For full information on the new line of WG9H Compressors, write for Bulletin 1013-13.

AIR MOVING EQUIPMENT FOR ALL INDUSTRY

JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

Circle 612 on Page 53

Joe W. Beckham, Texas Foundries Inc., Lufkin, Texas, is shown with his prize-winning entry in the malleable castings design contest which was sponsored by the Malleable Founders Society

Malleable Design Contest

Proves Economy of Castings

● FOUR of the five winners in the annual malleable castings design contest sponsored by the Malleable Founders Society won conversions to their material from fabrications on the basis of lowered part cost in production quantities.

Better appearance, machining and design versatility were contributing factors. The four conversions saved the buyers an estimated $11,250 in the initial runs—an average of 27 per cent.

This year's first-prize winner was Joe W. Beckham, Texas Foundries Inc., Lufkin, Tex. His design changed a welded pivot plate assembly to a one-piece malleable casting. The part functions as a bearing plate for a single gooseneck arm which connects the front axle of an earthscraper to the main body.

The former part was assembled and welded after the cylindrical section was bored. This method made it difficult to maintain a flat bearing area on the top of the part, adding to its expense and detracting from its appearance. Dissatisfied with the custom tailoring needed to produce the part, the maker accepted the malleable casting design when his orders warranted the start-up cost of a casting.

In malleable, the bolt holes are cast instead of drilled, weight is reduced more than 20 per cent, strength is increased because of the one-piece design, and the top bearing surface is perfectly flat. The buyer saved a straight 43 per cent of the cost of the former part, about half of which was attributable to lowered machine cost.

Torsion-Bar Suspension — Second award in the malleable design contest went to Paul Potter of Central Foundry Div., General Motors Corp., Saginaw, Mich., whose entry was a support arm for a truck torsion-bar suspension system in pearlitic malleable iron. In tests the part performed on a par with the forging it replaced, and the cost saving was substantial.

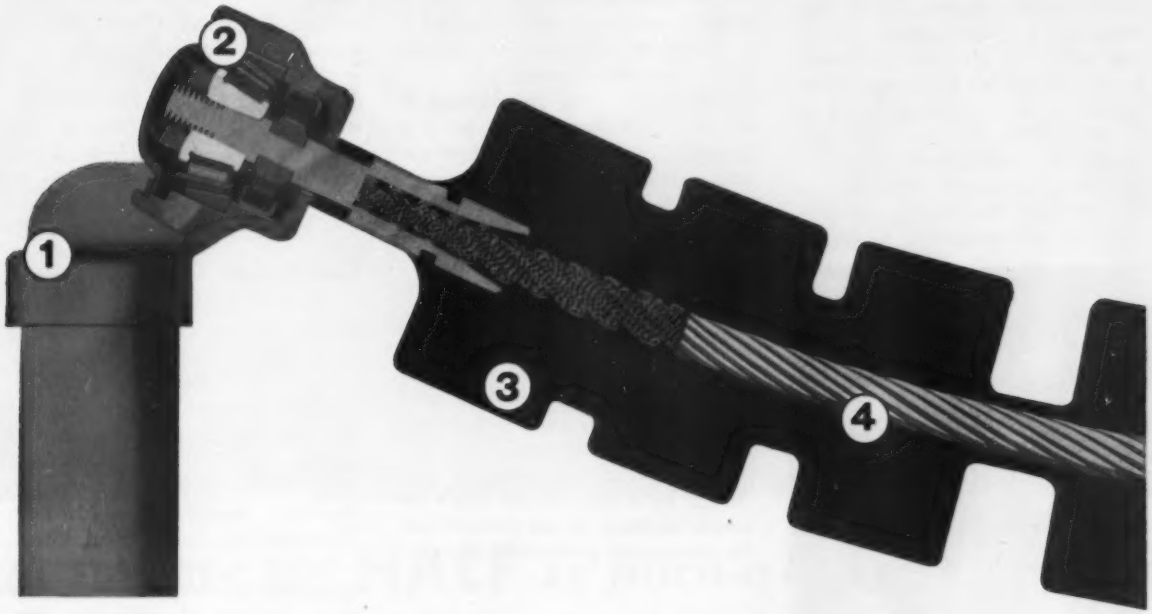
Third-place winner, John Entenmann of Northern Malleable Iron Co., St. Paul, saved the maker of an automatic packaging machine 20 per cent in redesigning a welded steel leg base to ferritic malleable. The malleable had other advantages, too—it weighed one-third less, offered a sturdier base eliminating the chatter which developed when the machine was moved; and permitted the manufacturer to have his trade name cast into the part.

Other Winners—Honorable mention winners in the contest were Richard B. Calhan of Dalton Foundries Inc., Warsaw, Ind., and Richard L. Gutenkunst, Milwaukee Malleable & Grey Iron Works, Milwaukee.

Mr. Calhan designed a malleable gear for farm machinery which opened a new market for his company. His gear, which is neither hardened nor machined, performed so well in the test program that the customer authorized two additional conversions to malleable gears. Savings ranged from 12 to 47 per cent for the three gears, and resulted in substantial new business for Dalton Foundries. The former parts were flame cut from steel with welded hub sprockets.

Mr. Gutenkunst's part was a two-piece deflector hub for an agricultural implement. The malleable casting cost 17 cents less than the welded part, but in addition it solved a vexing repair problem. Since the part is under constant shock, breakage and deformation were common. The malleable design reduced the breakage considerably, and when replacement is necessary, the malleable part can be installed 20 per cent faster than the weldment because of its two-piece design.

SIMPLICITY IS THE SECRET...



Joy Limberoller® Conveyor Idlers

The Joy Limberoller Conveyor Idler gives many times the normal service life because we made it as simple as possible. It is a flexible troughing idler with only *two* bearings and *one* moving element.

This simplicity means that there is nothing to get out of order. The two bearings are mounted in swivels (1) up in the support brackets, away from spillage. This prevents bearings (2) from clogging with dirt or freezing up. The corrosion-resistant neoprene rolls (3) absorb impact and cushion the load to give longer belt life. Where materials are wet or sticky, the "live action" of neoprene permanently bonded to special wire rope (4) provides constant flexing that prevents build-up on the idler.

Mounting is so simple that Limberoller idlers can be changed while the belt is running. Because the idler hangs in a true natural arc, it cushions and supports the entire belt, training perfectly and eliminating spillage. Limberoller idlers can be installed on your present equipment.

If you have a problem handling bulk materials, find out how the simple design of Limberollers can solve it. For complete details write for Bulletin 1252-13.

EQUIPMENT FOR ALL INDUSTRY

JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

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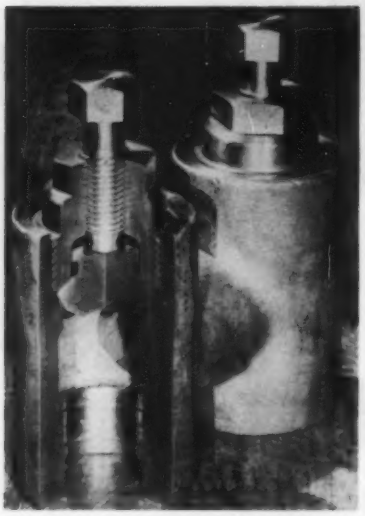
Foundry Developments

By EDWIN BREMER

Metallurgical Editor

Gives Long Service

CAST stainless header bodies shown in the accompanying illustration have given years of trouble-free service in a corrosive environment in producing high-octane gasoline at the El Segundo plant of the Standard Oil Co. of California. Serving as return bends controlling the direction of oil flow through the furnace, the fittings combine corrosion resistance with design ad-



vantages of castings. Header is designed to permit easy removal of coke which builds up in the headers and tubes after extended operation. They are made from Alloy Casting Institute's type CF-8 alloy containing 18 to 21 per cent Cr, 8 to 11 per cent Ni, and 0.08 per cent max. C.

Grain Size Control

INVESTIGATION of some factors which control the as-cast grain size of 30 per cent chromium cast irons is described in "Some Experiments Concerning the As-Cast Grain Size in 30 Per Cent Chromium Cast Irons" by J. Rickard in the March issue of *BCIRA Journal* (Birmingham, England).

Conclusions reached were that fine grain can be obtained by pouring at a temperature below 1400° C (2550° F), using nitrogen-bearing ferrochromium or sodium ferrocyanide to give a residual nitrogen of 0.2 per cent or more, or making a titanium addition prior to pouring to give a residual titanium content of 0.18 per cent or more.

Effect of N and Ti additions is much greater than that of pouring temperature. When N additions are used, tensile strength increases greatly, from 30 to 44.5 tons per sq in. (67,200 to 99,600 psi), and the Brinell hardness from 290 to 340.

Can Make Diamonds

RECENT announcement by Norton Co., Worcester, Mass., states that basic ideas for equipment and process for production of synthetic diamonds have been formulated and carried forward to a successful conclusion by a team of the firm's research workers. At the present time no commercial production is anticipated.

High Strength Steels

CAST ALLOY, high-strength steels were investigated to develop compositions with 12 per cent elongation, 30 per cent reduction of area, and 15 ft lb impact strength when heat treated to 180,000 psi tensile strength. In addition, the ultra-high-strength level was studied to determine the tensile strength where a reduction of area above 10 per cent could be maintained.

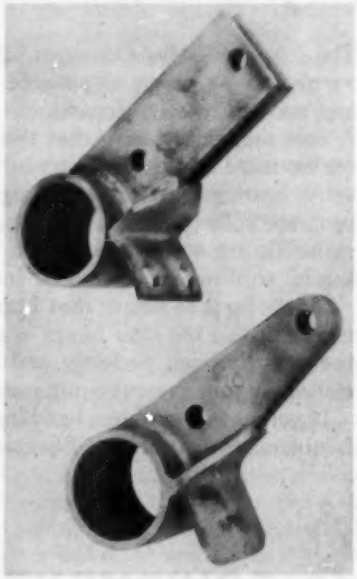
High purity of raw materials had a definite beneficial effect on ductility determined at the 180,000 psi and ultra-high-strength levels. Details are presented in "Development of Low Alloy Steel Compositions Suitable for High-Strength Steel Castings," which is available as report PB 161044 from the Office of Technical Services, U. S. Department of Commerce, Washington 25, for $2.50.

Abrasive Material

NEW metal abrasive claimed to possess excellent properties and to be made by a process unlike those commonly employed in production of steel and chilled iron abrasives has been developed by Globe Steel Abrasive Co., Mansfield, O. The material is called Globite and is available in shot and grit form. It is the result of a two-year study conducted at Battelle Memorial Institute. The new abrasive is said to equal steel abrasives in hardness and resistance to breakdown but to be more economical to produce.

Casting Cuts Cost

COST of fabricating a steel center lift bearing support for a large earth moving machine was three times that of the material. Additionally, time was required for drilling, and the finished product was square and bulky because trimming would make it still more expensive. However, engineers at Northern Malleable Iron Co., St. Paul, Minn., submitted a design incorporating the advantages of a casting and the good qualities of malleable iron. Result, as shown at the bottom of the accompanying illustration, was



a streamlined component with greater strength and less weight. Also, the one-piece casting cost 18 per cent less than the fabricated part.

REDUCE GAS WITH WERSMITH #401 CORE OIL . . .

#401 EVOLVES BUT HALF AS MUCH GAS AS OTHER OILS!

HERE'S PROOF!

Gas evolvement test run on briquette cores in nitrogen inert atmosphere at 1800°F. using sand and core oils, but no cereal binder.

	1 min.	2 min.	3 min.
WERSMITH #401	5.8 cc	6.6 cc	7.8 cc
Conventional Core Oil	11.2 cc	11.6 cc	13.0 cc

If core gas is your problem, here's good news! WERSMITH #401 core oil tests out, conclusively, as evolving but 50% as much gas as other core oils now on the market. (See chart at left.) Think what this can mean to you! For burner cores, alloy steel cores, core molds, malleable cores — WERSMITH #401 will bake out thoroughly and faster. You get a better "clear-through-bake" in less time. Less danger of unbaked core sections. Cores are harder — resist penetration and "burn-ins". After pouring — easier core shake-out. You'll find, too, that WERSMITH #401 is very fluid, free from stickiness and much easier to use.

We're "very high" on this product of ours — but, frankly, you've got to try it to appreciate it. There's no charge for small-quantity samples — trial drums cost more, so we'll have to bill you. But, either way, you're sure to profit! A letter, wire or phone call will get #401 on its way to you at once.

WERNER G. SMITH, INC.

1730 TRAIN AVE., CLEVELAND 13, OHIO • PHONE: TOWER 1-3676

"WERSMITH" CORE OILS COST LESS TO BUY... COST LESS TO USE

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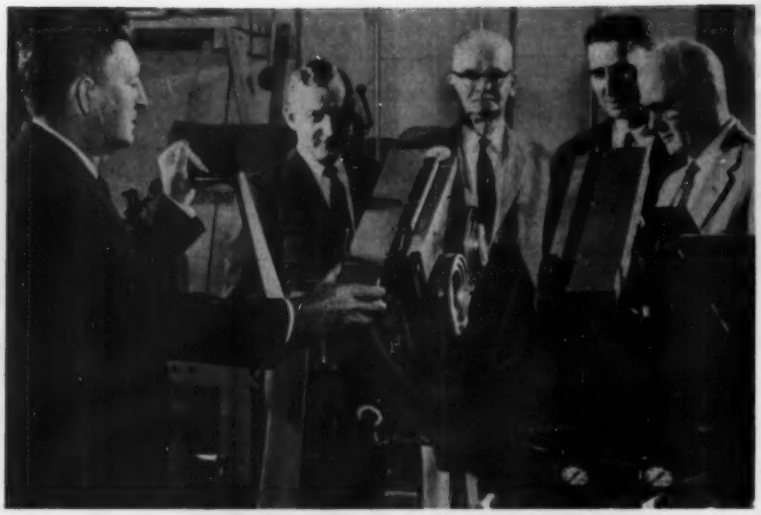


Dr. Luther Haynes, left front, demonstrates Auburn's new shell core machine. Looking on are, left to right: Dr. William Lane; Dan T. Jones; Harry Burns, Stockham Valves & Fittings Inc.; and Dean Fred H. Pumphrey

A student worker pours molten metal in the new foundry at Auburn University, Auburn, Ala.

Auburn University Acquires

MODERN FOUNDRY LABORATORY

● THE METALLURGICAL foundry laboratories at Auburn University, Auburn, Ala., a vital part of the School of Engineering, were strengthened recently by the addition of new equipment.

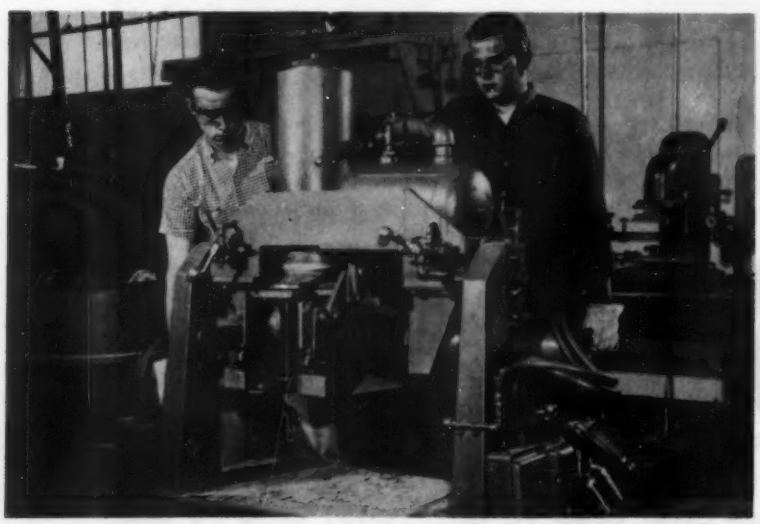
Primarily responsible for donating the new equipment were ten engineering companies which came to the aid of the university facility. As a result of their generosity, "Auburn now has one of the most modern metallurgical foundry laboratories in the South," says Dan T. Jones, head.

The companies and the items they donated are as follows:

National Acme Co., Shalco Div., Cleveland, a shell core machine; Centrifugal Casting Machine Co., Tulsa, Okla., a permanent mold machine; Whiting Corp., Harvey, Ill., a ladle and trolley; Standard Conveyor Co., St. Paul, a roller conveyor; Cleveland Tramrail Birmingham Co., Birmingham, a pouring conveyor; Pangborn Corp., Hagerstown, Md., a blast cleaning cabinet; Beardsley & Piper Div., Pettibone Mulliken Corp., Chicago, a CO_2 process coreblowing and gassing unit; National Engineering Co., Chicago, sand handling and conditioning equipment; H. K. Porter Co., Refractories Div., Bessemer, Ala., refractory brick; Osborne & Co. Truck Lines, Birmingham, free brick delivery.

Participating in the basic engineering for the new equipment was Stockham Valves & Fittings Inc., Birmingham.

With the installation of the new equipment in May, two years of



This shell core machine is one of many new pieces of equipment installed in Auburn's foundry

TEAMWORK IN FOUNDRY SCIENCE

. . . AND CHEMICAL RESEARCH

ANOTHER FOUNDRY FIRST . . . BY DELTA

NEW DELTA WASH
NO-VEIN KOAT

(NO. 167-4X)

PREVENTS Both VEINING & PENETRATION

IN MOST GRAY IRON, MALLEABLE AND NON-FERROUS CASTINGS

Prove it yourself in your own Foundry

Here is where to use DELTA NO-VEIN KOAT to prevent veining and metal penetration —

in conventional sand cores

- **Shell Cores**
- **Cold Set Cores**
- **Silicate Cores**
- **Air Set Cores**

A working sample of DELTA NO-VEIN KOAT WASH No. 167-4X will be furnished to you on request together with complete instructions for use. Please tell us the type of cores and kind of metal to be used in the test . . . and also the method of application of the wash.

Note these distinct advantages of DELTA NO-VEIN KOAT;

1. Mixed with water, DELTA NO-VEIN KOAT forms a rich, creamy-smooth emulsion for ease of application by dipping, brushing, swabbing or spraying at a suitable Baume.
2. Shell cores, normally difficult to coat uniformly with ordinary washes, accept DELTA NO-VEIN KOAT instantly and uniformly without build-up in pockets, corners or recesses in either hot or cold applications.
3. DELTA NO-VEIN KOAT will not change the contour of cores nor, in any way, affect the dimensional characteristics.
4. When dry, DELTA NO-VEIN KOAT produces uniformly smooth, highly refractory surfaces over which molten metal moves freely, without turbulence or disturbance.
5. DELTA NO-VEIN KOAT has excellent peeling characteristics; casting surfaces are smooth and free from veining and metal penetration.

DELTA NO-VEIN KOAT is a new type of plastic wash which provides benefits afforded by no other wash. In addition, it is low in cost, easy and economical to use. It is the result of persistent research by Delta chemists working in close cooperation with foundry technicians and operating personnel in a variety of foundries.

DELTA NO-VEIN KOAT has been fully tested-in-use to prove its uniformity of performance and to establish the requirements for ease of handling, efficiency of application and economy of use.

OUR 27TH YEAR

DELTA

GOOD TO THE CORE

DELTA OIL PRODUCTS CORP. • MILWAUKEE 9, WIS.

MANUFACTURERS OF
SCIENTIFICALLY CONTROLLED FOUNDRY PRODUCTS

Circle 615 on Page 53

Foundrymen have discovered
once they try

ABMET CLEANING STARS

they won't use anything else . . . not even their own!

For more than thirty large American foundries, Abmet cleaning stars mean substantial savings in cleaning costs. Abmet's abrasive-resistant qualities are many times higher than ordinary chilled or hard iron cleaning stars, and Abmet's Brinell hardness of 440 from surface to core assures sharp cleaning edges, longer life, more uniform cleaning ability and greatly reduced milling time. Replacements become much less frequent. That's why more foundries are giving up casting their own cleaning stars.

If you are wasting costly time, effort and material casting stars, you can save up to 500 percent in cleaning star costs by switching to Abmet.

Once you have cleaned castings with Abmet stars YOU WON'T USE ANYTHING ELSE!

For price list, sizes and styles, WRITE:

AGRICULTURAL ABMET BEARING METAL

QUINCY FOUNDRY, INC.

QUINCY, OHIO

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GEORGE A. POPE 1906-1960

GEORGE A. POPE, business manager of FOUNDRY, died unexpectedly May 31 at his home in Hudson, Ohio, following a heart attack. His death ended nearly 30 years of association with this publication.

He was born in Wooster, Ohio, March 12, 1906, and grew up in Elyria, Ohio. After being graduated from Wesleyan University, Middletown, Conn., he taught school before joining the Penton Publishing Co. in the FOUNDRY circulation department in 1930.

Mr. Pope left Penton in 1933 to engage in sales activities, and for a time was with the General Electric Co., Nela Park, Cleveland. When he returned to the FOUNDRY staff in 1936, he was named assistant advertising manager that year. In 1940, he became Chicago district manager, in charge of sales and other business activities in that area. He served in the latter capacity until 1950, when he was made business manager, with headquarters in Cleveland.

Mr. Pope was active in various organizations identified with business publications and for many years was a member of the American Foundrymen's Society.

work culminated in the creation of a modern, useful instructional and research facility.

Mr. Jones gets the credit for visualizing a completely new foundry. When Fred H. Pumphrey arrived in Auburn two years ago as the new dean of the School of Engineering, he immediately recognized the obsolescence of the existing foundry. Mr. Jones suggested that a campaign to acquire modern machinery and equipment should be undertaken.

With the support of Dean Pumphrey, Mr. Jones publicized the story of Auburn's foundry needs. A sympathetic hearing was given by an ardent alumnus, Harry Burns, factory manager, Stockham Valves & Fittings. Mr. Burns helped to form a committee from the American Foundrymen's Society, and the committee dedicated itself to refitting the Auburn foundry.

Serving with Burns on the committee were L. H. Durdin, Dixie Bronze Co., Birmingham, past president of AFS, and M. D. Neptune, James B. Clow & Son Inc., past chairman of the Birmingham Chapter of AFS.

The group met with Auburn officials in November, 1958, to plan the setting up of a modern metallurgical laboratory. Momentum was gained as individuals and companies gave aid. In time, the equipment was received and installed.

Completion of installation has been described by Dean Pumphrey as a monument to those who took up the slack between what a modern foundry laboratory must have and what Auburn University could afford with its state appropriation.

"The re-equipping of the foundry will enable Auburn to provide better assistance to industry," the dean stated. "That will complete the cycle. Industry helped Auburn by providing the foundry equipment. Young engineers, taking the Foundry Technology course, will, as graduates, be better able to understand many engineering problems that they will face in industry. And this is all because of new techniques

Malleable Founders Call for

IMPROVED TECHNOLOGY, AGGRESSIVE MARKETING

● IMPROVED TECHNOLOGY and aggressive pioneering in new markets were called for by members of the Malleable Founders Society at its annual meeting, held at the Elbow Beach Surf Club, Hamilton, Bermuda, June 6-7.

These aims were expressed through continued support of the advertising program under the direction of the Malleable Castings Council.

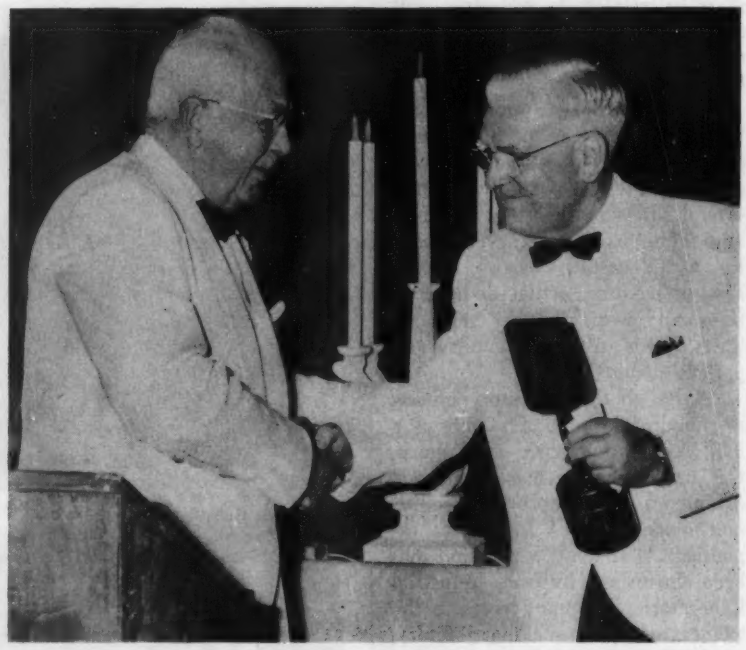
Charles P. Speitel, incoming society president and president, Pennsylvania Malleable Iron Corp., Lancaster, Pa., said that the outlook for malleable is improving through new and varied uses being found for it in the auto and other industries and through interest generated by advertising and publicity.

He pointed out that despite a first-half lag, malleable tonnage this year should surpass the 910,000 tons produced last year. Some member foundries either have expansion programs under way or have completed them recently to meet demands for greatly increased tonnages in the near future.

Mr. Speitel succeeded Dudley V. Walker, vice president, Eberhard Div., Eastern Malleable Iron Co., Cleveland.

Major Accomplishments — In his report to the members, Mr. Walker cited four major accomplishments of the last year. These included publication of a comprehensive handbook on malleable iron castings, publication of elevated temperature research on malleable iron, a continuation of the advertising program, and the successful expansion made within the industry to meet the demands of the auto industry.

This also was a year of self-analysis within the industry, according to Mr. Walker. Modernization of facilities was given extensive study through conferences on financial planning and capital spending and at a special modernization clinic. At the latter, new systems were demonstrated to show their cost reduction and efficiency features.



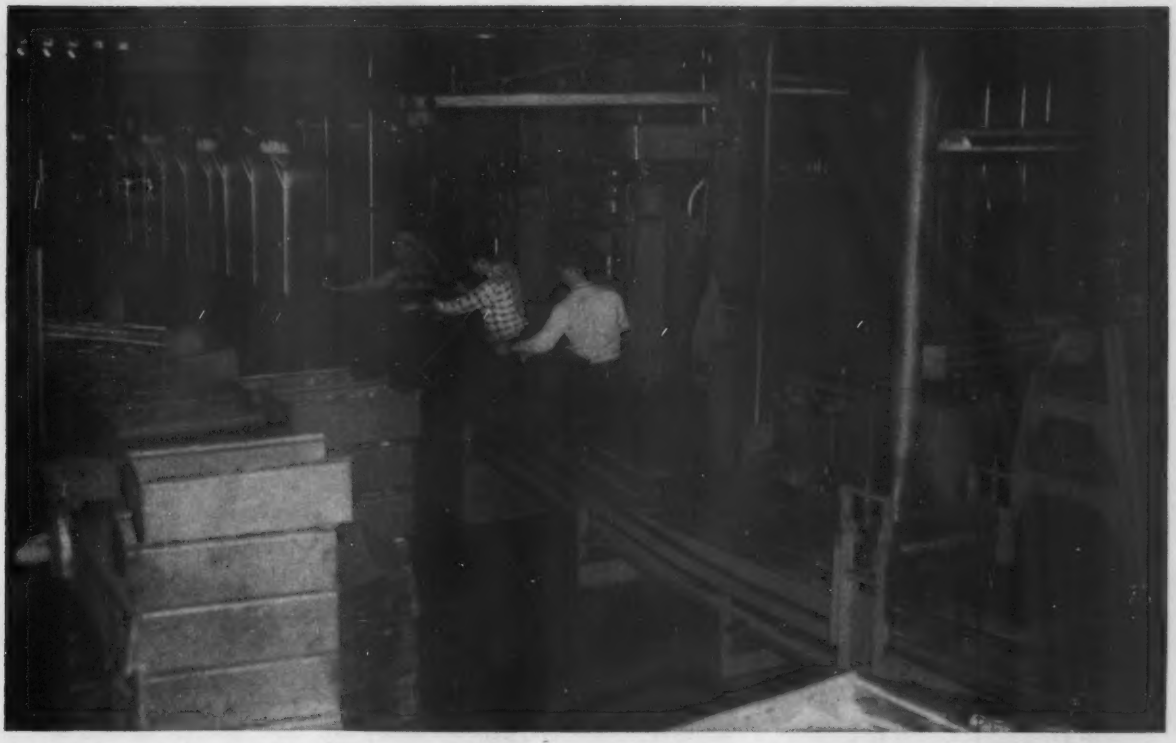
Dudley V. Walker, left, retiring president, passes the society rammer to his successor, Charles P. Speitel, at the MFS annual meeting

At its annual market development conference, the malleable industry's major consumers were invited to assess the industry and its product, and they presented several challenges which the industry must face in the coming years to keep its place in the market.

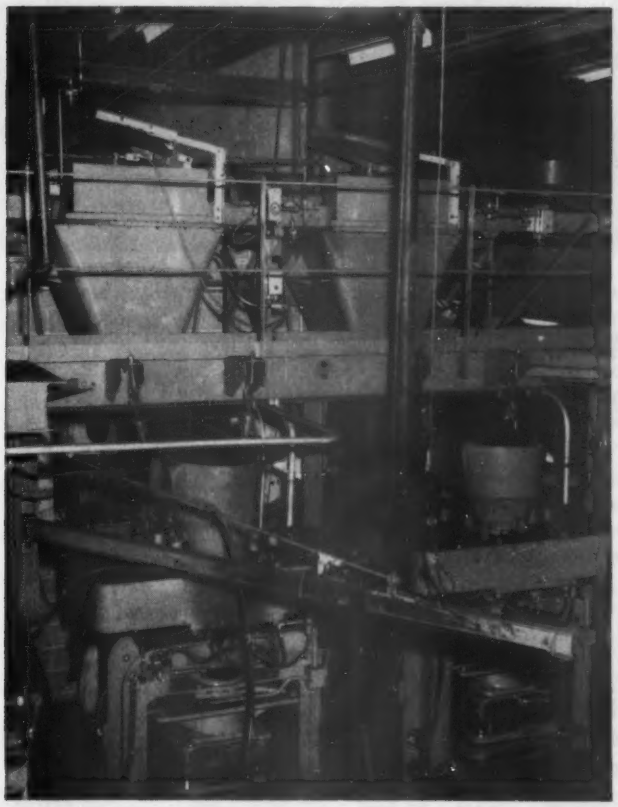
Medal Presented — The McCrea Medal, emblematic of distinguished service and accomplishment in the malleable iron castings industry, was presented to Charles M. Brust, who recently retired from the presidency of Eastern Malleable Iron Co., Naugatuck, Conn.

Mr. Brust was president of the society in 1955-56 and served on its board of directors and on several committees. When he retired from Eastern Malleable in February of this year, he lacked only a few months of marking his 50th anniversary with the company. During that time, he had served in practically every executive capacity and at five of Eastern's plants.

New Directors — Three new directors were named to the society's board of directors, and one of the present directors, Robert S. Bradshaw, president and general manager, Texas Foundries, Lufkin, Tex.,



With Jeffrey's engineering assistance, *TAPPAN* production is doubled in half the floor space



The 400-foot L-shaped Jeffrey Mold Conveyor, used in connection with semi-automatic molding machines, made it possible to reduce the molding area to one-half its previous size.

Capacity of the sand handling system supplied by Jeffrey 15 years ago was increased from 35 to 65 tons per hour.

Murray Manufacturing Company's foundry at Murray, Kentucky, has recently been expanded to produce all castings for all Tappan stove plants. The problem was to double this plant's past production without having to increase its size. With Jeffrey's help, the area devoted to molding was cut in half, making this space available for other operations.

A Jeffrey Mold Conveyor is the heart of the new layout. All molding and pouring takes place on this continuous conveyor, with a mold being completed every 15 seconds. Jeffrey vibrating conveyors handle the shakeout, sand and castings. Under the new system, a standard flask size was adopted, instead of the five sizes used before, contributing to greater production and efficiency.

Jeffrey foundry equipment is described in Catalog 911. For a copy, write The Jeffrey Manufacturing Company, 907 North Fourth St., Columbus 16, Ohio.

JEFFREY

CONVEYING • PROCESSING • MINING EQUIPMENT...
TRANSMISSION MACHINERY... CONTRACT MANUFACTURING

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was named society vice president.

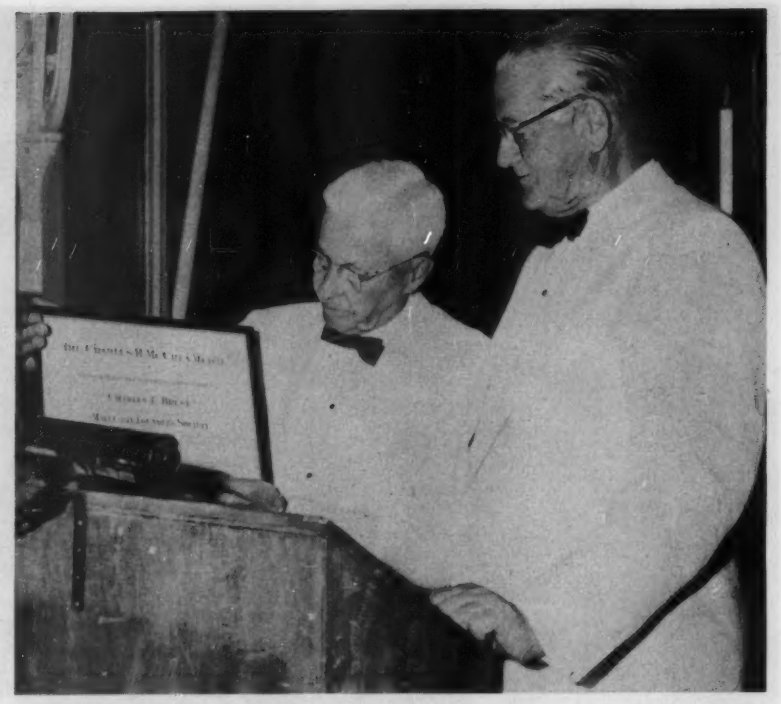
New directors, each of whom will serve four years, are Clarence I. DeShong Jr., president, Oriskany Malleable Iron Co., Oriskany, N. Y.; Lawrence J. Gallagher, vice president and general manager, Ironton Div., Dayton Malleable Iron Co., Ironton, Ohio; and William M. Dalton, president, Dalton Foundries Inc., Warsaw, Ind.

President's Recommendations—In his outline for the coming year, Mr. Speitel singled out two research projects—those concerned with basic properties and with machining of malleable—which will be reported on before the end of the year. He challenged members to produce castings which meet the ever-changing needs of user industries, and he offered the facilities of Malleable Founders Society—its technical bulletins, conferences, and consultation services—to help them attain this objective. Mr. Speitel also urged continuance of the society's marketing program, which now includes conferences for marketing personnel, publicity, and direct mail and magazine advertising.

Committee Reports — John J. Jacobs, controller, Peoria Malleable Castings Co., Peoria, Ill., and chairman of the Accounting Committee, reported that his group held its first two financial management workshops during the year.

A report by Thomas M. Blank, vice president, Pennsylvania Malleable Iron Corp., Lancaster, Pa., and chairman of the society's Technical Committee, summarized progress on the society's two current projects. Concerning the machining study, Mr. Blank reported that experiments have been performed, with both oxide and carbon tools, involving malleable, pearlitic malleable, bronze, and two grades each of steel, nodular iron, and gray iron.

Basic property research, Blank reported, is concerned with stress-rupture relationships for malleable iron and with carbide stability during solidification. The latter phase of this study is expected to yield information on microstructural changes which occur in malleable during solidification. The stress-rupture tests are continuing to produce useful data on the behavior of ferritic and pearlitic malleable at elevated temperatures.



James H. Smith, right, Central Foundry Div., GMC, presents the McCrea Medal and plaque to Charles E. Brust on behalf of the MFS for his distinguished accomplishments in the malleable iron casting industry

Joseph Abusamra, president, Belcher Malleable Iron Co., Easton, Mass., and chairman of the Society's Market Development Committee, cited the continuation of the society's direct mail program and of its annual market development conference and the increased emphasis on publicity as highlights of the last fiscal year. Altogether, the publicity program produced 14 articles of major significance, covered society affairs and research results, and made announcements for member companies. A special conference devoted to management of the sales function was held, and another is planned for the near future.

Harvey E. Steinhoff, sales vice president, Wagner Castings Co., Decatur, Ill., reported on behalf of the Handbook Committee that the book had been published during the fiscal year and that more than 10,000 copies had been distributed. He recommended that to keep malleable users up to date on the technology of the industry, a re-edited and expanded edition of the handbook be published in 1965.

1960 Prospects—Donald B. Sanberg, administrative director for the society, reported on the industry's business outlook for the last half of 1960. He pointed out that although malleable tonnage probably will be about 13 per cent below normal for the first half of 1960, the industry's customers are experiencing very favorable sales of their products. This situation, according to the society's forecast, stems from an inventory reduction by durable goods manufacturers. Unless customers sales drop off substantially, malleable shipments will bounce back to at least normal levels.

Technical Developments—In his report to the membership, Hans J. Heine, technical director of the society, described three new developments which have potential significance for the malleable foundry industry. These include a permanent mold process, a method of surface hardening recently developed in Germany, and new structural adhesives for joining malleable castings. Mr. Heine also stated that a thesis on the thermodynamics of the iron-carbon-silicon system had been received by the society and would be reported on in the near future.

Circle 619 on Page 53→

To all metals Norton adds the first "Touch of Gold"

The term "precision-snagging" has yet to be invented – and the delicate touch is not a cleaning room technique. But snagging, the roughest, toughest, most basic type of grinding does benefit considerably by the "Touch of Gold" — built into all Norton grinding wheels to improve product quality and cut production costs.

Your operators, working on machines of any type or size, will like the easy, fast-cutting action of Norton snagging wheels. And *you'll* like the way they grind off more metal per dollar and turn out better work, bringing the true "Touch of Gold" to your production. See your Norton Man or your Norton distributor about test runs to determine exactly the wheels you need for best results on any metal. NORTON COMPANY, General Offices, Worcester 6, Mass.

NORTON
ABRASIVES

75 years of . . . Making better products . . . to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Machine Tools • Refractories • Electro-Chemicals — **BEHR-MANNING DIVISION:** Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

CHECK THE BIG CHANGES IN INDUCTION MELTING

In just seven years, Inductotherm has changed the face of induction melting with a barrage of new ideas. Some have resulted in lower costs . . . others have simplified operation, maintenance, and installation. But all have been aimed at making induction melting more useful, and a better buy, than ever before.

IDEA #1 . . . *Packaged Controls:* By shrinking the size of capacitor banks to permit behind-the-panel mounting, Inductotherm was able to introduce the first pretested, prewired melting furnace controls in induction history.

IDEA #2 . . . *Integral Power:* M-G set, starter, transformer and capacitors were first packaged as a compact movable unit in the melting control console of the Inducto "Integral" series, which now includes capacities up to 100 KW.

IDEA #3 . . . *Design Innovations:* Inductotherm has consistently been first with new features in furnace design. Tilting furnace power feed through the trunions is one example, Heliarc welded furnace construction is another.

But these ideas barely scratch the surface. For the greatest innovation has been the Inductotherm concept of service. Not just fast repairs and overnight replacement of parts (even M-G sets) . . . but a basic concept: *Inductotherm is out to fit induction melting to your needs.* We will make every possible effort to improve our equipment and the induction technique, never asking you to trim your requirements to the limitations of our equipment.

If you'd like more information on Inductotherm furnaces, write for Bulletin 70. But, for a taste of Inductotherm service, ask to have an engineer call. Inductotherm Corporation, 412 Illinois Avenue, Delanco, New Jersey.

INDUCTOTHERM

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Malleable Castings Council Extends Advertising Activities

● OFFICIALS of the Malleable Castings Council, advertising arm of the malleable iron industry, reported favorable readership ratings for their advertisements during the last year and introduced two new programs to relate reader interest to casting sales more effectively.

The Council's advertising campaign was reviewed by Robert L. LaMarche, president of the council and vice president-treasurer, American Malleable Castings Co., Marion, Ohio. The council held its annual meeting at Elbow Beach Club, Hamilton, Bermuda, June 6-7, in conjunction with the annual meeting of the Malleable Founders Society.

Two new phases in the campaign —an inquiry followup procedure and point-of-sales displays—were described by Lowell D. Ryan, executive vice president, Malleable Founders Society, and Donald B. Sanberg, advertising director of the council.

Mr. Ryan outlined a plan designed to extract as much present business as possible from the advertising program and at the same time to give members a means of evaluating the impact and impression created by the current advertisements. It involves the close followup of each inquiry to the advertisements.

Mr. Sanberg demonstrated a new flip chart presentation to be used by sales personnel to describe the advantages of malleable iron castings. Such an aid, he said, is a necessary link between the first impression created by an advertisement and the final decision to buy the product.

To underscore the importance of the advertising campaign, Mr. Sanberg pointed out that it would have cost $20 million to reach the same number of people that the advertising did in the last year. The program, he said, produced advertisements in 3 million copies of magazines. On the basis of the accepted readership average of 30 per cent, this figure means that 900,000 valid contacts were made during the year.

Members of the council elected Joseph B. Gutenkunst, president, Milwaukee Malleable & Grey Iron Works, Milwaukee, to be council president, and named James M. Sweeney, advertising director, National Malleable & Steel Castings Co., Cleveland, to be vice president. Joseph S. Hornstein, vice president, Meadville Malleable Iron Co., Meadville, Pa., was retained as treasurer, and Bruce Allen, sales engineer, Dayton Malleable Iron Co., Dayton, Ohio, was named secretary.

Named to the Steering Committee with those above were L. D. Auker, Eastern Malleable Iron Co., Naugatuck, Conn.; T. J. Kirby, Northern Malleable Iron Co., St. Paul, Minn.; Mr. LaMarche; L. L. Shafer, Central Foundry Div., General Motors Corp., Saginaw, Mich.; and E. K. Simonsen, Belle City Malleable Iron Co., Racine, Wis.

Book Review

Coated Abrasives — Modern Tool of Industry, **hard cover, 400 pages, published by Coated Abrasives Manufacturers' Institute, 711 Third Ave., New York 17, N. Y. Price $4.50 plus 25 cents per book for handling and mailing.**

Illustrated reference book on coated abrasives features engineering and design information on such points as economic factors in belt grinding, coated abrasive machines, and special forms of coated abrasives. Basic purchasing information including specifications on contact wheels, drums, rolls, and platens, and special information on coated abrasive practices in metalworking and other industries, also is given.

Book contains descriptions of the use of cutting oils, coolants and lubricants, fixturing and chucking of workpieces, safety practices in the use of coated abrasive machinery, and practical production recommendations and suggestions.

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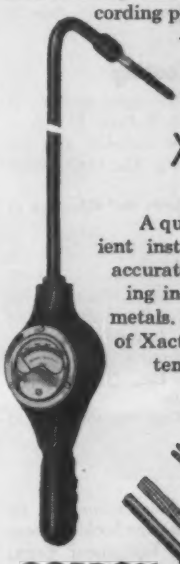

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Literature for Foundrymen

For More Information Use Reply Card—Page 53

Thermocouple Tubing

High-temperature swageable thermocouple tubing is detailed in a technical bulletin. Chemical analysis, standard sizes, and tolerances are given.—Saxonburg Ceramics Inc., Saxonburg, Pa.

For More Details Circle No. 406—Page 53

Repair of Lifting Magnets

Booklet B-7757 describes economical repair and modernization of lifting magnets.—Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa.

For More Details Circle No. 407—Page 53

Core and Mold Coating

Features of Korglaze core and mold coating are discussed in Bulletin K-2. Suggestions for use of the material also are given.—United Oil Mfg. Co., 1429 Walnut St., Erie, Pa.

For More Details Circle No. 408—Page 53

Three-Way Valves

Bulletin 91023 supplies diagrams for full-capacity series, three-way valves. The 12-page booklet also contains specifications, ordering information, and dimensions.—Airmatic Valve Inc., 7313 Associate Ave., Cleveland 9, Ohio.

For More Details Circle No. 409—Page 53

Air Hoists

Specifications and illustrations of air hoists are given in a 16-page booklet, Form 5756, Section 6.—Aro Equipment Corp., Bryan, Ohio.

For More Details Circle No. 410—Page 53

Diecasting Machines

Illustrated 30-page booklet contains descriptions and technical data on diecasting machines.—Kux Machine Co., 6725 N. Ridge Ave., Chicago 26, Ill.

For More Details Circle No. 411—Page 53

Zirconium Oxides

Four-page illustrated brochure lists zirconium oxides and high-temperature materials and describes processes the company uses to manufacture its refractories.—Zirconium Corp. of America, 31503 Solon Rd., Solon, Ohio.

For More Details Circle No. 412—Page 53

Roofing Guide

Manual covers common roof problems and recommends repairs and maintenance to overcome each.—Monroe Co., 10703 Quebec Ave., Cleveland 6, Ohio.

For More Details Circle No. 413—Page 53

Heavy-Duty Cylinders

Bulletin 7300 contains technical information, illustrations, and descriptions of heavy-duty cylinders.—Oilgear Co., 1560 West Pierce, Milwaukee 4, Wis.

For More Details Circle No. 414—Page 53

Mechanical Arm

Bulletin No. 6-B112 contains electrical and mechanical descriptions and general specifications of Model 150 mechanical arm for alpha-gamma handling.—Nuclear Equipment Dept., Mechanical Div., General Mills Inc., Central Avenue at 17th, Minneapolis, Minn.

For More Details Circle No. 415—Page 53

Glass-Bag Filters

Bulletin 806 presents illustrated application data describing glass-bag filters.—Dracco Div., Fuller Co., Harvard Avenue and East 116th Street, Cleveland 5, Ohio.

For More Details Circle No. 416—Page 53

Dust and Fume Scrubber

Four-page Folder No. W-8560 presents features of the Oriclone high-energy dust and fume scrubber.—Ducon Co., 147 E. Second St., Mineola, L. I., N. Y.

For More Details Circle No. 417—Page 53

Potentiometer

Tapot tape-potentiometer is featured in Technical Bulletin 5000. Folder includes data on mounting and clearance dimensions.—Howell Instrument Corp., 3101 Trinity St., Fort Worth 7, Texas.

For More Details Circle No. 418—Page 53

Did You Miss These?

Here is a list of popular literature items offered in recent months:

SHELL CORE MACHINES—Dependable Shell Core Machines Inc., Portland 14, Oreg. Circle 402, Page 53

THERMAL INSULATION (Catalog IN-244A)—Johns-Manville Sales Corp., New York 16, N. Y. Circle 403, Page 53.

ZIRCONIUM—Zirconium Association, Cleveland 15, Ohio. Circle 404, Page 53.

ALUMINUM ALLOYS (Brochure 28-114-10)—Aluminum Co. of America, Pittsburgh 19, Pa. Circle 405, Page 53.

Wear Plates

Literature describes Resist-Abrade trunnion-head wear plates for noise reduction in tumble-type shot cleaning equipment.—A.I.C. Engineering Co., P. O. Box 55421, Uptown Station, Indianapolis, Ind.

For More Details Circle No. 419—Page 53

Melting Practice

Booklet contains "Do's and Don'ts of Good Melting Practice for Non-Ferrous Foundries."—Campbell-Hausfeld Co., Harrison, Ohio.

For More Details Circle No. 420—Page 53

Safe Material Handling

Catalog No. 60 contains information on safety hooks and links, back-up alarms, truck steps, and safety belts.—E. D. Bullard Co., Sausalito, Calif.

For More Details Circle No. 421—Page 53

Olivine Foundry Sands

Bulletin 60-1 covers properties of olivine foundry sands and gives information on their use for nonferrous, gray iron, carbon steel, and manganese steel castings, shell molding, and ladle linings.—Northwest Olivine Co., 329 Kincaid, Mt. Vernon, Wash.

For More Details Circle No. 422—Page 53

Barrel Finishing Media

Jetforms barrel finishing media are described in Bulletin No. 900.—Lord Chemical Corp., 2068 S. Queen St., York, Pa.

For More Details Circle No. 423—Page 53

Industrial Trucks

Folder presents a comprehensive analysis of industrial trucks for die handling. Booklet also offers full specifications.—Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland 3, Ohio.

For More Details Circle No. 424—Page 53

Flat-Flame Burners

Series 4832 flat flame burners are detailed in Bulletin 48.32, which gives information on applications, characteristics, safety, and operation of the burners.—North American Mfg. Co., 4455 E. 71st St., Cleveland 5, Ohio.

For More Details Circle No. 425—Page 53

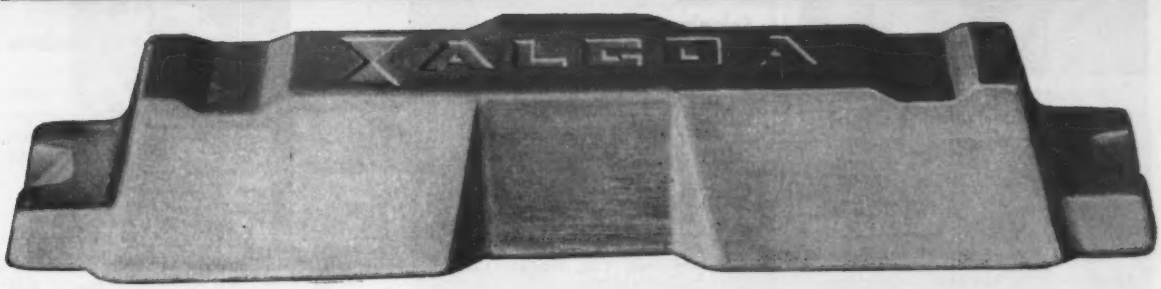
Hoist Specifications

Six-page booklet, "HMA-300 Standard Specifications for Manually Lever Operated Chain Hoists," contains tables and recommended minimum standards on lever-operated hoists of ratchet and pawl and load brake design using roller or

Alcoa's new low-silhouette parallel-stacked bundle provides the answer to small furnace-door openings for users who charge whole bundles at a time. Only 30 in. high, this bundle contains 47 pigs and weighs 2,350 lb . . . yet, thanks to Alcoa's new interlocking pig and four steel straps, it's just as safe and easy to handle as the standard bundle.

Standard bundles of Alcoa's new 50-lb interlocking pig are cross-stacked and look like this . . . when we ship them and when you get them. Made up of 44 pigs in a 2,200-lb package, bundles are designed for fork truck handling, but are stable enough for transfer with crane and slings.

ALCOA ANNOUNCES A NEW 50-POUND INTERLOCKING PIG



. . . DESIGNED TO CUT YOUR HANDLING COSTS

Alcoa, the company that pioneered steel-tied bundles for aluminum pig and ingot, has now come up with a better bundle. Thanks to a new interlocking feature and other design changes cast into Alcoa's 50-lb pig, bundles are tighter and more compact. Pigs can't be jarred out of position in shipment. You'll move bundles out of the railroad car or truck trailer faster, move them through your plant with greater speed and safety, then stack them higher. And these benefits, as every operating man knows, add up to real economies.

In its continuing effort to satisfy all customer needs, Alcoa spent several years consulting with customers and testing bundles under every conceivable condition. The design finally adapted incorporates a simple side-to-side locking device. Strapping, too, underwent exhaustive testing both in the laboratory and under actual shipping and foundry conditions. Two straps were found to be barely adequate, three better, and four best . . . for maximum safety and stability. Alcoa's 50-lb pig will all be bundled with four steel straps.

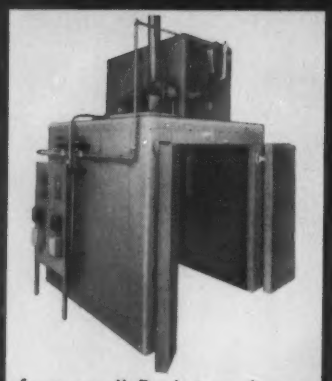
Available in either of the two bundles illustrated, Alcoa's new interlocking pig may also be ordered for shipment in polyethylene bags if desired. For full details and your free copy of Alcoa's new booklet listing all grades and alloys in pig and ingot form, contact your local Alcoa sales office or write: Aluminum Company of America, 2115-G Alcoa Building, Pittsburgh 19, Pa. World-wide sales through Alcoa International, Inc., 230 Park Avenue, New York 17, N.Y.

ALCOA ALUMINUM

ALUMINUM COMPANY OF AMERICA

Circle 622 on Page 53

LANLY heat processing equipment for the FOUNDRY INDUSTRY



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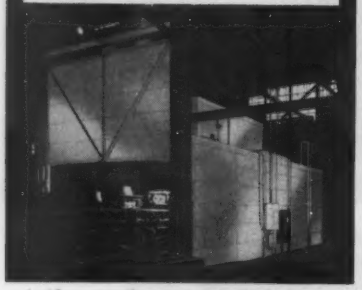

If a need arises to replace or improve your Foundry Ovens, it is only logical to look to LANLY, recognized authorities in the design and construction of heat processing equipment for more than 22 years.

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link coil chain.—**Hoist Manufacturers Association**, 1 Thomas Circle, Washington 5, D. C.

For More Details Circle No. 426—Page 53

Roller Chains and Sprockets

Book No. 2757 lists over 2000 types and sizes of stock roller chains and sproc'kets

available for immediate delivery.—**Link-Belt Co.**, Dept. PR, Prudential Plaza, Chicago 1, Ill.

For More Details Circle No. 427—Page 53

High-Alloy Castings

Twelve-page reprint is an article from *Machine Design* on factors involved in selecting high alloy heat-resistant castings for applications in which temperatures exceed 1200° F.—**Alloy Casting Institute**, 1001 Franklin Ave., Garden City, N. Y.

For More Details Circle No. 428—Page 53

Selenium Rectifiers

Bulletin SR-160 presents detailed information on selenium rectifiers.—**Miller Electric Mfg. Co.**, 718 S. Bounds St., Appleton, Wis.

For More Details Circle No. 429—Page 53

Control Valves

Details of air and hydraulic control valves are given in Catalog No. S-60.—**Beckett-Harcum Co.**, 985 W. Locust St., Wilmington, Ohio.

For More Details Circle No. 430—Page 53

Air Placement Gun

Folder describes features and advantages of a one-man gun for air placement of refractory materials.—**Ridley & Co.**, 11275 Massachusetts Ave., Los Angeles 25, Calif.

For More Details Circle No. 431—Page 53

Matchplates

Literature describes and illustrates pressure cast matchplates.—**Scientific Cast Products Corp.**, 1390 E. 40th St., Cleveland 3, Ohio.

For More Details Circle No. 432—Page 53

Fork Lift Trucks

Operating data, descriptions, and dimensions of models FTP40-24 and FTP30-24 pneumatic-tire fork lift trucks are given in Bulletin BU-498.—**Allis-Chalmers Mfg. Co., Engine-Material Handling Div.**, 1126 S. 70th St., Milwaukee 1, Wis.

For More Details Circle No. 433—Page 53

Foundry Equipment

Eight-page bulletin illustrates and describes molding machines, sand systems, sandrammers, shell molding machines and core blowers, and mullers.—**F. E. (North America) Ltd.**, 47 Advance Rd., Toronto 18, Ontario, Canada.

For More Details Circle No. 434—Page 53

Guide to Silicone Products

Bulletin CDS-129B is a guide to the company's line of silicone products. Guide also contains information for obtaining more details on specific products.—**Silicone Products Dept., General Electric Co.**, Waterford, N. Y.

For More Details Circle No. 435—Page 53

Electric Furnaces

Electric furnaces using silicon carbide heating elements are described in Bulletin HD-153A. Furnaces are illustrated.—**Hevi-Duty Electric Co.**, P. O. Box 563, Milwaukee 1, Wis.

For More Details Circle No. 436—Page 53

Air Compressors

Balanced/opposed industrial air com-

pressors are covered in Bulletin 185.—**Clark Bros. Co.**, Olean, N. Y.

For More Details Circle No. 437—Page 53

Atmosphere Analyzer

Brochure explains operation and installation of Model 184B furnace atmosphere analyzer and includes specifications.—**Instrument Div., Perkin-Elmer Corp.**, Main Avenue, Norwalk, Conn.

For More Details Circle No. 438—Page 53

Vibrating Screens

Catalog S-581 gives complete information on vibrating screens of various types. The 30-page booklet is illustrated.—**Simplicity Engineering Co.**, Durand 7, Mich.

For More Details Circle No. 439—Page 53

Graphite for Industry

Bulletin on "Graphite for Diversified Industrial Applications" contains informa-

tion on graphite's typical physical properties and chemical content and a review of important industrial applications. — Electrode Div., Great Lakes Carbon Corp., 18 E. 48th St., New York 17, N. Y.

For More Details Circle No. 440—Page 53

Dust Collectors

Catalog DK-820 contains details on DusKolectors. The 16-page booklet also presents features, dimensions, and specifications on accessories.—Hammond Machinery Builders Inc., 1605 Douglas Ave., Kalamazoo, Mich.

For More Details Circle No. 441—Page 53

Scalers and Chipping Hammers

Section 42, page 1, and Section 12-12f describe Weld-Flux scalers and scaling and chipping hammers. Specifications are given.—Gardner-Denver Co., 1101 Front St., Quincy, Ill.

For More Details Circle No. 442—Page 53

Anchors and Hangers

Supplemental Bulletin No. 725 gives dimensions and illustrations of refractory anchors and hangers—J. H. France Refractories Co., 1944 France Rd., Snow Shoe, Pa.

For More Details Circle No. 443—Page 53

Power Units

Bulletin 99A has information on gasoline, diesel, and LP-gas power units for material handling vehicles. Bulletin is illustrated.—Ready-Power Co., 3826 Grand River Ave., Detroit 8, Mich.

For More Details Circle No. 444—Page 53

Portable Air Hoists

Folder illustrates portable air hoists and gives specifications.—Thor Power Tool Co., 175 N. State St., Aurora, Ill.

For More Details Circle No. 445—Page 53

Welding Equipment

Form ADC 7096 contains illustrations and descriptions of manual, semiautomatic, and automatic Heliwelding equipment. Information on accessory equipment, tungsten electrodes, and filler wires is included.—Air Reduction Sales Co., division of Air Reduction Co., 150 E. 42nd St., New York 17, N. Y.

For More Details Circle No. 446—Page 53

INDIANAPOLIS
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INDIANAPOLIS FOUNDRY COKE
its unsurpassed Quality
is your assurance of Quality Castings
Its high carbon content . . . low sulphur . . . low ash and uniform carbon absorption . . . its carefully controlled structure and sizing . . . all combined to produce a coke of unsurpassed quality. Indianapolis coke gives maximum metal temperature with minimum coke per charge.
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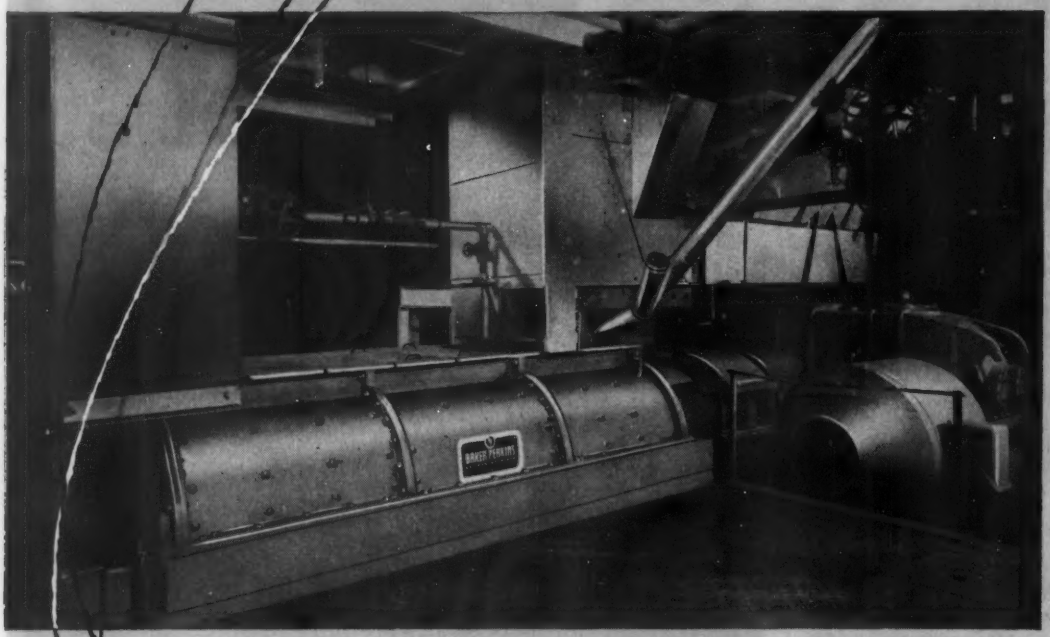

The new Baker Perkins Size 8 Muller, now in successful operation in one of the midwest's automotive foundries, has 300% more hourly capacity than any available batch type muller and 100% more capacity than the next size B-P continuous unit. As with all B-P Continuous Mullers, cleaner, smoother castings are obtained with fewer rejects because molding sands are thoroughly mixed and tempered. The special Sigma-type agitators assure that each grain of sand is coated with the correct proportion of bond.

Baker Perkins builds Continuous Mullers in capacities from 30 to 300 tons per hour. Because of their rigid, rugged construction, B-P Continuous Mullers give many years of service. Installations in many of America's largest foundries have proven the efficiency of Baker Perkins Continuous Mullers under the most exacting conditions.

For further information about B-P Continuous Foundry Sand Mullers and B-P Unidor mixers for core and special process sand mixing, send for catalog No. F-156.

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BAKER PERKINS INC.

FOUNDRY MACHINERY DIVISION • SAGINAW, MICHIGAN

Around the Country

NEWS REPORTS FROM

Boston . . . Philadelphia . . . Chicago . . . Pittsburgh

Boston— Foundry operations in this region will be reduced in July. Most shops will be down for vacations and will enter this period with small or nonexistent backlogs. Orders for malleable castings, however, were slightly heavier through June. Although most specified prompt shipment, hopes are held that a small accumulation of orders may be booked when pouring is resumed in the second half of July.

Gray iron foundry schedules have been easing, with orders spotty. First-half volume was below expectations, and most producers feel that the second six months may show an improvement. This attitude is based on the fact that consumers have low inventories of castings and on an expected increase in machine tool orders.

Textile mill equipment shops have the heaviest backlogs and are operating somewhat above the average. They are not, however, farming out work as in the past. Slackness with steel foundries reflects the drag in heavy equipment orders.

Ferrous foundries are confronted with higher pig iron costs—$4 to $5 per ton in many instances, with the stockpile at Everett, Mass., about cleaned out. Fred S. Holway, sales manager, Mystic Iron Works, and publicity chairman, New England Chapter, AFS, has been transferred to Pittsburgh by Eastern Gas & Fuel Associates.

A rash of freight rate reductions to New England points from Troy (new basing point) and Beacon, N. Y., continues. Both Buffalo iron stored for reshipment from Beacon and increased imports point to more intense competition for New England tonnage. Most larger melters indicate that they will buy partial requirements from both Troy and Beacon. Based on past experience (during shortages), they are reluctant to depend on a single supplier, especially with no Everett tonnage available under former contract agreements.

With the current freight $7.20 from Troy, delivered price in the Boston area is $75.70.

Philadelphia— A further dip in casting demand appears probable in July, for the fourth consecutive month. But with the peak of the vacation season over in that month, a slow upturn may set in—this, despite the fact that August, usually much depressed by seasonal influences, is likely to be a dull month, with no appreciable improvement anticipated until after Labor Day.

Gray iron operations in June are estimated to have been 65 to 70 per cent of normal capacity, with backlogs one to three weeks. As for a number of months, production has been supported mostly by light and medium work. Jobbers report a fair smattering of power transmission work; also of paper making, chemical equipment, and material handling machinery requirements.

Various shops have been operating no more than three to four days a week, and where five days are maintained, it has been with limited working forces. Over the next several weeks various foundries will be closed at least one to two weeks for mass vacations. One exception may be the Burlington, N. J., shop of the United States Pipe & Foundry Co., which until recently had been handicapped by a strike of several months' duration.

Steel foundries continue to operate on a hand-to-mouth basis, with backlogs light. It is doubtful if June operations averaged more than 65 per cent. Steel foundries feel particularly the lack of heavy

DUCTILE IRON SOCIETY: Meeting in Philadelphia on May 11, the Ductile Iron Society discussed industry problems and elected five new directors. Officers and directors shown here, left to right, are: Seated—Niel H. Mingledorff, Savannah Machine & Foundry Co., director; G. W. Phelps, Otaco Ltd., director; Robert S. Thompson, H. P. Deuscher Co., president; William Beatty, Morris Bean & Co., vice president; J. R. Ludwig, Soundcast Co., director. Standing—E. C. Graham, Acme Foundry & Machine Co., director; R. K. Guise, Kuhns Bros. Co., treasurer; James H. Lansing, executive secretary; Arthur Avedisian, Taylor & Fenn Co., director; Sam F. Carter, American Cast Iron Pipe Co., director; H. J. South, American Brake Shoe Co., director. Other new directors are E. P. Trout, Lufkin Foundry & Machine Co., B. L. Baptist, Beloit Iron Works, and E. W. Aylward, Neenah Foundry Co.

industrial equipment activity.

Malleable business continues to slump. Whereas until a couple of months ago most malleable foundries were operating five days a week, some shops now are working no more than three days and few if any are operating a full five days. Lack of demand for hardware and pipe fittings is being particularly felt.

Brass and bronze shops continue to experience rough going. This applies both to independent and captive producers. Marine castings are in spotty demand, and water meter and plumbing supply needs are slack. Inquiry for industrial valves and pumps is holding up better than most lines but is far from brisk. Many red metal shops are doing no better than three days a week. Somewhat in contrast, the light metal foundries are doing fairly well, some operating five days a week. Diversity of requirements for household appliances is said to be contributing importantly to aluminum casting consumption.

Raw materials are in ample supply, particularly such tonnage items as pig iron and scrap. Two district blast furnaces have recently suspended operations indefinitely—one of the two furnaces at Swedeland, Pa., and the Chester, Pa., furnace, which latter, however, had not been supplying iron to the merchant trade.

Pittsburgh— Heavily dependent on the steel companies for business, foundrymen here are suffering through a recession that started in April, when the mills began to cut back their production. Second-quarter steelmaking operations plummeted from 90 per cent of capacity to 60, and throughout the decline the mills liquidated their inventories of castings. Maintenance men were warned that they must pay strict attention to monthly budgets and keep their purchases

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Plans Progress for 1960

Diecasting Show and Congress

● RESPONSE to the First National Die Casting Exposition and Congress by the end of May has resulted in the sale of nearly 50 per cent of the exhibition space available. The event is sponsored by the Society of Die Casting Engineers and will be held at the Detroit Artillery Armory, Detroit, Nov. 8-11.

The exhibition will be supplemented by a technical program which will include 24 papers to be presented at eight sessions. One session of three papers each will be offered each morning and afternoon of the meeting. Subjects were chosen on the basis of a survey of diecasters to determine what topics are of greatest interest to them.

Author commitments are being obtained by the program committee, of which Harry D. Hall and David C. Salatin, both of General Motors Corp., are chairman and vice chairman, respectively. Technical co-operation is being extended to the SDCE by the American Zinc Institute, the Magnesium Association, and the Aluminum Smelters Research Institute.

Areas to be covered in the technical sessions include die design, vacuum diecasting, anodizable aluminum diecastings, die steels, diecasting equipment, finishing of castings, lubricants, diecasting automation, and diecasting alloys.

To aid in the fulfillment of a successful convention, the SDCE organized a tour for its membership to the Third International Die Casting Conference, held in Stresa, Italy, May 16-20. Among the 77 persons who attended as part of the SDCE delegation were John L. MacLaren, Aluminium Ltd. Sales Inc., Detroit, chairman of the SDCE event, and other officials of the Detroit convention. All sought ideas which could be incorporated in the SDCE show and conference.

To house visitors, 2000 rooms have been reserved in six leading Detroit hotels. Headquarters hotel will be the Sheraton Cadillac. A feature of the meeting will be a banquet, planned for Thursday, Nov. 10, at which an outstanding speaker will give his views on the diecasting industry.

to a minimum.

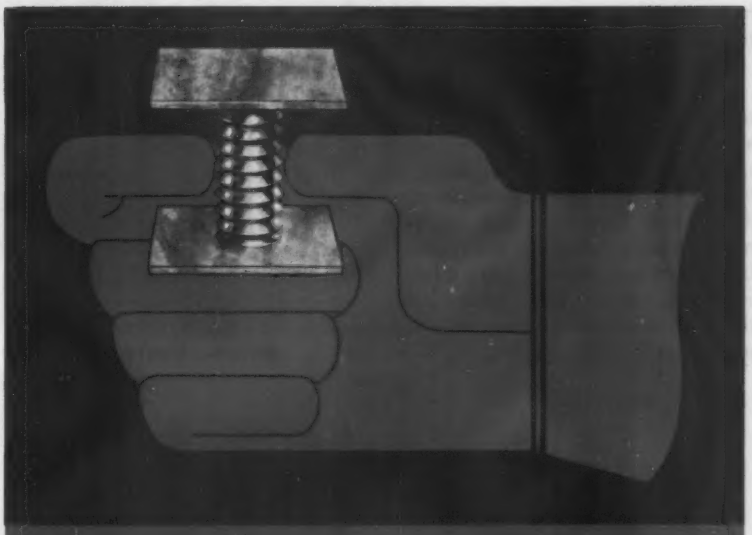
Even when the mills were operating at a high level—as they were in the first quarter—they didn't order as many castings as their suppliers expected. "They did their best to make life tough for us," a gray iron foundry complains. "First they tried to extract the last penny of profit from our quotations; then they demanded instantaneous deliveries. Everything we shipped them went right into service; nothing went into stock."

There's no denying that steelmakers have a reason for trimming their inventories (customers have been drastically reducing their raw steel stocks), but foundrymen think the mills are overdoing it. Worse yet, other industries are following suit—even though they're enjoying good business. Sales to manufacturers of power shovels, farm equipment, forging machines, and hydraulic presses have slumped badly. Demand from railroad car builders is fair, but a far cry from what it was six months ago.

Operations at a leading gray iron foundry are averaging about 55 per cent of capacity. Although it's working four days a week, the firm hasn't been booking enough business to justify keeping its doors open more than three days. "We'd like to cut back, but we can't," a company official declares. "Our customers wouldn't stand for it. They're operating on a hand-to-mouth basis—counting on us for fast deliveries."

At a major steel foundry, conditions are no better. Despite five-day operations, production is equivalent to only 45 per cent of capacity because only one shift is working. Orders have declined steadily since mid-April, and tonnage booked in the first ten days of June was only one-third of the volume entered during the corresponding period in May. Because of vacation shutdowns in customer plants, July is expected to be even worse.

On the brighter side, a large producer of iron rolling mill rolls reports good business through May and no significant letdown in June. "Our backlog is about as big now as it was at the start of the year—in quantity if not in dollars," a sales executive comments. In spite of low-level steel production, there have



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Circle 626 on Page 53

been few requests from the mills for delayed delivery.

Chicago— Gray iron foundry operations in this area continue slow and disappointing. Chiefly responsible are the seasonal decline in demand for the automotive industry and failure of farm equipment demand to live up to expectations. Jobbing shops report mixed conditions—some find sales still slowing, whereas others are experiencing a slight pickup.

Late August and early September are expected to see a marked upturn in automotive requirements as initial production of 1961 model cars begins, but the farm machinery outlook still is obscure.

July is the month in which the majority of jobbing foundries will close for varying periods for vacations. This will allow orders to accumulate to create bigger backlog levels than have been the rule during the last three months. Currently, operations are on a four to five-day week basis, but in April and May three-day weeks were quite prevalent.

There is no disposition for foundries to carry more than bare minimum inventories of pig iron and coke; consequently, suppliers see little improvements in their business until third quarter. Supplies of both commodities are more than adequate.

* * *

A proposal that the city of Milwaukee abandon garbage collection from single family homes and duplexes and install incinerators in each home instead would, were it to be adopted, modestly stimulate ferrous and nonferrous castings demand. Incinerators utilize a number of castings in burners, grates, valves and fittings.

The proposal was made to the common council's building-grounds and finance committees in early June by the representative of a Milwaukee manufacturer of gas incinerator controls. He said his plan could save the city and its residents $15 million in the next 10 years.

It was stated that while the general city budget had increased by 225 per cent over the last 15 years, the garbage bureau budget had grown by almost 400 per cent, to more than $3.5 million in 1959. On the basis of the last 15 years, the garbage budget could increase another 200 per cent by 1970. One factor which boosted the budget during the 15-year period was that the bureau started collecting noncombustible material other than garbage in 1954.

It was said that new incinerators could be purchased, installed, and financed for a five-year period for about $100 a unit. It was proposed that the property owner pay 60 per cent, or about $60, with the city paying the other $40. The home owner would pay about $12 a year for the first five years for the incinerator, plus about $20 a year for fuel plus repair costs.

Although this is higher than the estimated $18 a home annual cost of garbage collection now, the property owner should be more than compensated in lower property taxes because of sharp reductions in the garbage bureau budget.

The committees referred the proposal to the commissioner of public works for a study and report.

PROVIDES LONGER LIFE-NO HOT SPOTS

Acme melting pots and ingot molds assure even heat distribution without hot spots . . . they improve non-ferrous casting quality and put a damper on rejects. Cast of a specially developed iron alloy, Acme pots and molds provide great strength and unusual resistance to high temperatures, too. As a result they consistently reduce down time and substantially cut replacement costs.

Stocked in forty sizes and a complete range of styles, you can standardize on Acme melting pots and molds and be confident of immediate shipment at all times! Take advantage of all these benefits . . . proven over a period of more than 30 years.

★ **FORTY SIZES IN STOCK**

Quick delivery anywhere in the United States eliminates your "stand-by" non-ferrous pot and mold inventory. Write for bulletin listing all sizes and styles.

Acme FOUNDRY CO.

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Chart of Accounts and Cost Dictionary Issued by NFFS

Chart of Accounts and Cost Dictionary has been issued by the Non-Ferrous Founders' Society as Supplement No. 1 to *Basic Cost Principles for Non-Ferrous Foundries.* The new publication is designed to facilitate adoption and installation of either the simplified or expanded cost system detailed in *Basic Cost Principles.* Supplement also aids in distribution of expense items.

The chart lists and designates account numbers for over 60 balance sheet and nearly 100 income statement accounts. Numbers assigned are grouped to enable quick identification and also allow room for additional accounts. Dictionary section is a breakdown of 350 expense items common in nonferrous foundries into three classifications: Wages and salaries, material and supplies, and miscellaneous expenses. The appropriate department, including overhead, is given for each item as well as the correct account.

Both publications can be obtained from the Non-Ferrous Founders' Society, 1604 Chicago Ave., Evanston, Ill. The chart and dictionary is $2 and the *Basic Cost Principles* is $5.

SOUVENIR PLAQUE: Bronze plaques like this, presented by the Worshipful Company of Founders, were given to each of the 17 apprentices participating in the European Foundry Apprentice Competition as mementos

Circle 628 on Page 53→

BRIQUETTING SYSTEM

AUTOMATIC SHAKEOUT SYSTEM

BULK HANDLING SYSTEM

PV

FINDS THE ANSWERS

"PV" stands for *Planet Versatility* . . . a quality that has made Planet Corporation known throughout the foundry industry as an organization that has solutions to the most perplexing production, materials handling, or automation problems.

Planet Corporation engineers apply uninhibited thinking to foundry problems to find workable solutions that increase efficiency. No job is too big or too difficult . . . Planet's "PV" engineers have designed complete foundries, automated molding lines, built bulk and unit materials handling systems, developed the world's only true universal transfer device . . . they are experts, in fact, on all types of special handling and automation machinery, and materials handling equipment.

Let Planet demonstrate how its versatile engineering skill, and production and erection know-how can help you. Discuss your problem with a Planet "PV" engineer . . . *it pays to Plan with Planet.*

ARE YOU ADDING WATER TO YOUR SAND *manually?*

eliminate the guess work with the new
DIETERT-DETROIT MILL MOISTMETER

SHOWS moisture content of sand in muller throughout mixing cycle.

ELIMINATES guess-work at sand-preparing station.

REDUCES casting losses through uniform moisture control.

INCREASES mold production by supplying uniform sand to molding stations.

Dietert-Detroit No. 3901 Mill Moistmeter

1. Indicates moisture of sand in mill before discharge. Gives operator constant control for proper water addition.
2. Indicates temperature of sand batches. This shows operator when to add extra water to allow for evaporation from hot batches.
3. Low cost unit provides maximum moisture control for uniform sand batches.
4. Compact, rugged case requires small space. Can be conveniently placed anywhere for maximum operator efficiency.
5. Easy-to-read illuminated meter dials.
6. 6" moisture scale has large indicator hand for greater visibility.
7. Simple, trouble-free circuitry contains no timers, relays or vacuum tubes.
8. Quick representative sampling is assured by a durable metal sensing probe and thermocouple placed in the mixer.
9. **Optional RECORDER** provides permanent record of moisture content in each batch of sand. This compact remote recorder can be used anywhere. Placed in superintendent's office, unit gives exact moisture content at a glance without going out into foundry.

DIETERT DETROIT

HARRY W. DIETERT CO.
9330 Roselawn
Detroit 4, Mich.

HARRY W. DIETERT CO.
9330 Roselawn, Detroit 4, Michigan

Gentlemen:
Send me facts on the new Dietert-Detroit No. 3901 Mill-Moistmeter.

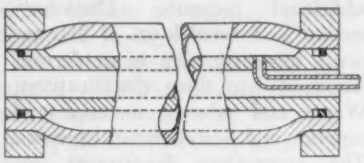
Name_____
Title_____
Company_____
Address_____
City_____ Zone____ State_____

PATENTS

Of Interest to Foundrymen

Grain Refinement

Improvement in physical characteristics, and more particularly refinement of the grain structure, of centrifugally cast stainless steel tubes or hollow cylinders is accomplished by 1) expanding the diameters about 16 per cent through application of hydrostatic pressure, 2) heat treating the expanded tube to effect re-



crystallization, which then is followed by 3) water quenching the recrystallized tube.

Method also provides a means of forming larger diameter seamless tubes or cylinders from smaller castings by cold expanding, annealing, and re-expanding and annealing several times. Such tubes also have a smaller grain size after recrystallization heat treatment and quenching. *Patent No. 2,931,744 granted to M. L. Samuels and assigned to United States Pipe & Foundry Co.*

Shell Molding

Bonding agent for the shell molding process is said to provide great strength and good metallurgical properties of molds at a low cost. It is composed of a mixture of solid oxidized drying oil and sulfur.

One method of producing the material as a coating on the refractory used for forming the molds consists of mixing 84 kg dry quartz sand with 3.35 kg powdered sulfur in an edge mill. To that material a hot mixture of 1.92 kg of drier-free linseed oil with 2.88 kg of hard lignite pitch is added. Then a solution of 100 grams of potassium permanganate in acetone or water is allowed to flow in a thin stream while the machine is running. The mixture hardens in one or two days, and then is ground in an edge mill to disintegrate the grains. Coated material is used in the same manner as

Circle 628 on Page 53→

a Planet "Pv" engineer . . . *it pays to Plan with Planet.*

YOU SAVE $$$ because this plastic STAYS MOIST 2 YEARS

PALLETIZED FOR EASY HANDLING

IT'S ALWAYS SAFE to save money by ordering **Ironton NOJOINT** in 550 pound drums because this plastic refractory stays moist and usable for **TWO YEARS!**

SAVE THREE WAYS WITH NOJOINT IN DRUMS

1. No loss from drying out. Tight lid keeps **NOJOINT** always ready for day-to-day jobs.
2. Skip the warehouse charges, purchase larger quantities direct from Ironton.
3. Freight cost per ton is lower on single large shipment than on small re-orders.

WHEREVER HOT METAL RUNS in your foundry, use **NOJOINT.** Best for lining ladles, cupola spouts, tapholes, slag holes... and for patching the cupola well.

OTHER CONVENIENT PACKAGES OF NOJOINT

- 100 lb. cartons MOIST in slices 2" thick.
- 100 lb. bags, DRY. Mix with moisture content and other additions as you prefer.

Ironton engineers will visit your foundry and show your men how to use **Ironton NOJOINT** and where. Write or call today for the latest bulletin and additional information.

SINCE 1917 IRONTON FIRE BRICK COMPANY IRONTON, OHIO

1333 Ashtabula Street

Write or call Ironton collect for name of nearest representative.

Circle 630 on Page 53

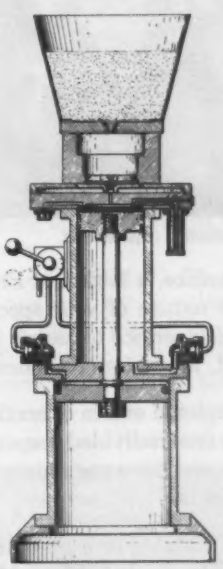
conventional material in mold making. *Patent No. 2,927,032 granted to M. Lottermoser and assigned to Croning & Co.*

Nodular Cast Iron

Relates to an improved method of producing nodular iron from a gray cast iron by use of tellurium and magnesium-silicon containing 10 per cent magnesium, 30 per cent silicon, and remainder iron. Amount of tellurium addition is based on section size to be cast, and is 0.05 per cent for sections up to 1 in., 0.06 per cent for those 1 to 3 in., and 0.07 per cent for sections over 3 in. Amount of magnesium-silicon addition is 30 to 70 times the equivalent tellurium addition. The equivalent tellurium addition is the actual tellurium addition plus one-half of the sulfur content of the melt minus 0.05 times the manganese content. *Patent No. 2,933,385 granted to W. H. Moore and assigned to Meehanite Corp.*

Core and Mold Blower

Machine for producing cores or molds employs a vacuum to draw the sand from an overhead hopper into the core or mold box. Bottom of the hopper contains one or more



cone-shaped slotted nozzles of a resilient material such as rubber. Core or mold box placed under the hopper contains suitable screened or slotted vents opening into a disk-shaped chamber on top of the machine which, in turn through suit-

NEW CEMENT proved in service holds up BEST in Thick Joints

MAKE A TEST OF IRONTON Red-I IN YOUR PLANT

Ironton **RED-I** is THE mortar for joints that must be . . . or just happen to be . . . THICK. In extra stiff mix, **RED-I** WON'T SHRINK in joints or openings wide as ¾". HIGH BOND STRENGTH lasts through severest punishment (to 3100° F). Try **RED-I** for heat treating furnaces and general repairs; thin it down for economical service in other applications.

For Stopper Rods in any application, the right and ready mortar is **RED-I** . . . developed especially for this purpose. Performance of **RED-I** immersed in hot metal proves its stamina for wider use.

Get better results, better workability, better value in **RED-I** . . . packed dry in 100-lb. bags, or wet in 200-lb. drums.

Try RED-I at N/C

Call or write to arrange a test. We supply a free trial lot of **RED-I** and you pay only the freight.

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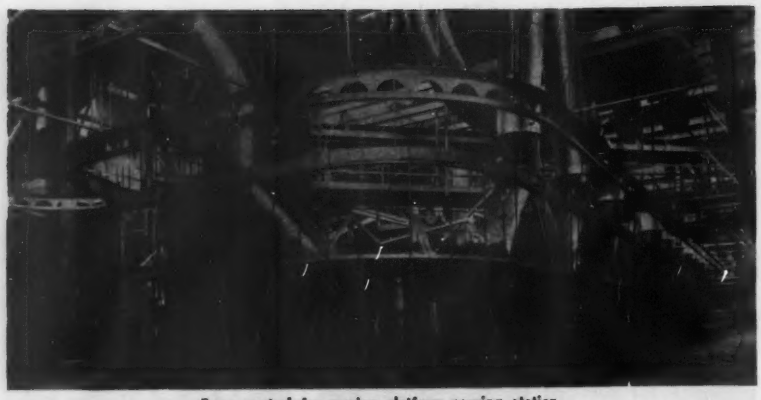
Write or call JE 2-3621 collect for name of area representative

Circle 631 on Page 53



Fume control for moving platform pouring station.

No two fume control problems are alike!

Moving platform pouring station, lower production requirements.

Since no two fume control problems are alike, a Kirk and Blum engineering survey determines the exact nature of *your* specific application. It's all part of K & B's *complete* service to assure you the best system for your particular need, all factors considered.

From survey time until the system is completed and in operation, Kirk & Blum handles the entire job with one undivided responsibility . . . a condition only possible when you have *one* source for all service, *one* guarantee for all components.

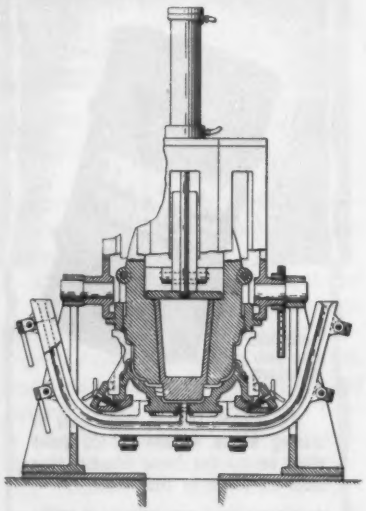
Write today for the new 52-page K & B Catalog or a no-obligation survey of your particular problem. The Kirk & Blum Mfg. Co., 3108 Forrer St., Cincinnati, 9, Ohio.

KIRK & BLUM *Complete Fume and Dust Control Systems*

able passages, is connected to an opening at the top of the small piston. Vacuum for drawing the sand from the hopper is created by action of compressed air on the much larger piston in the bottom cylinder of the machine which causes the upper and smaller piston to move down extremely rapidly in its cylinder. *Patent No. 2,933,785 granted to Fritz Hansberg.*

Permanent Mold

Metal mold for making aluminum wheel castings and the like comprises separable mold sections recessed to provide an annular casting cavity with a feeding cavity di-



rectly attached to it. Mold sections include several side sections, a cap section, and a core section, with the feeding cavity within the cap section. Sprue section is attached to the cap section.

The machine is arranged to be rotated after filling so that the sprue section is at the top, excess metal in the sprue being caught in ladles. Cap and core sections are moved axially away from each other, and the side sections move laterally from the closed positions and from the cap and core sections. *Patent No. 2,932,070 granted to S.W Jackson and E. G. Fahlman, and assigned to Permold Co.*

Nodular Graphite Iron

Describes a process for producing cast iron with graphite in nodular form with a radial structure, without a radial structure, or with a metal core surrounded by graphite

and appearing like a doughnut.

Gray cast iron used as the base is defined by carbon limits 2.5 to 4.5 per cent, and silicon limits 1.0 to 4.0 per cent. The silicon content is related to the carbon content so that the percentage of silicon divided by 3.1 plus the percentage of carbon divided by 4.5 is greater than 1. The nodular graphite form results from addition of 1 to 5 per cent natural or synthetic mica to the molten iron, followed by inoculation with 0.2 to 0.3 per cent silicon by use of a silicon-containing agent. *Patent No.* 2,932,567 *granted to N. R. Evans.*

Fume Collecting Hood

Invention relates to a hood to be placed over an electric furnace to collect fumes escaping through the roof. It consists of a cylindrical side wall of a diameter to fit on the roof, and a circular flat deck carried by the wall. The deck contains a window dimensioned to clear a group of electrodes inserted vertically through the roof. A group of polygonal closures, each containing an electrode port, substantially fill the window in the deck. Each of the port openings contains a refractory spacer ring. A duct extending from one point in the side wall leads to a suitable exhaust fan. *Patent No.* 2,932,679 *granted to D. W. Pierce and assigned to U. S. Steel Corp.*

Sand Bonding Agent

Advantageous results are claimed to be obtained when a compound capable of liberating ammonia under conditions of mold use, is employed in combination with a polyhydroxy mixture in a silicate binder. The silicate has a preferred silica to alkali metal oxide ratio of 2.4 to 2.84:1. The ammonia liberating agent is urea or various amines or amides, and the polyhydroxy mixture may be sugars such as glucose, fructose, succrose or saccharides; glycols; sorbitol, glycerol, etc.

One composition is given as containing 5 to 10 per cent urea and 5 to 10 per cent sorbitol by weight of the silicate. Binder also may contain minor amounts of finely divided coal, wood, coke, flour, etc. *Patent No.* 2,926,098 *granted to F. P. Ilenda and J. L. Foster and assigned to Diamond Alkali Co.*

lasts *over twice* as long as other belts!

Handling hot shakeout sand demands a belt that is really rugged. That is why a 355 ft. length of 30" x 7 ply Super-Insulated Sahara* is used for this gruelling sand reclaiming operation at this tractor foundry.

This belting thrives on heat and abrasion that kill off other belts 2 to 5 times faster . . . does a better job at far less cost to you.

Its special INNERLOCKED* construction of heavy-duty hard silver duck, long-fiber asbestos insulation, and exclusive impregnating compounds will give you maximum resistance to temperatures up to 600 degrees. Let Imperial solve your foundry needs. Time to start—Now.

Phone or write for complete information on how Imperial's Super-Insulated Sahara* can serve you better . . . cost you less.

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You expect MORE from Imperial . . . and you get MORE!

Imperial INNERLOCKED BELTING

First in stitched canvas belting for over 50 years

MAIL FOR HELPFUL DATA

Imperial Belting Co.
1760 S. Kilbourn Ave., Chicago 23, Ill.

( ) I'd like a free belting survey of my plant

( ) Please send your catalog and engineering handbook.

Name_____

Company_____

Address_____

Photo Recording System

Saves Manhours . . . Cuts Scrap

By ARTHUR MUSGRAVE
Foundry Superintendent
I-T-E Circuit Breaker Co.
Greensburg, Pa.

Above, Arthur Musgrave demonstrates the manner in which a casting is identified in his company's foundry. Right, he photographs a casting on the floor of his office with a Polaroid Land camera

● WE HAVE SAVED thousands of man-hours in production time and reduced our scrap losses from faulty molds to less than 2 per cent by using a quick-photo data recording system as an aid to our molding operations.

Before sending to the machine shop any casting which is a new job, we photograph it with a Polaroid Land camera and attach the print to a data card bearing detailed molding information. When subsequent orders are received for the casting, we simply tie the photo-data card to the pattern and send it to the foundry, thus providing an accurate specification of the molding operation and a graphic illustration of what the final casting should look like.

At I-T-E's Greensburg plant we manufacture high-current electrical power switches, power distribution equipment, circuit testing devices, and other allied products requiring metal parts or housings. It is not unusual for us to engineer and fabricate a complete high-voltage outdoor substation.

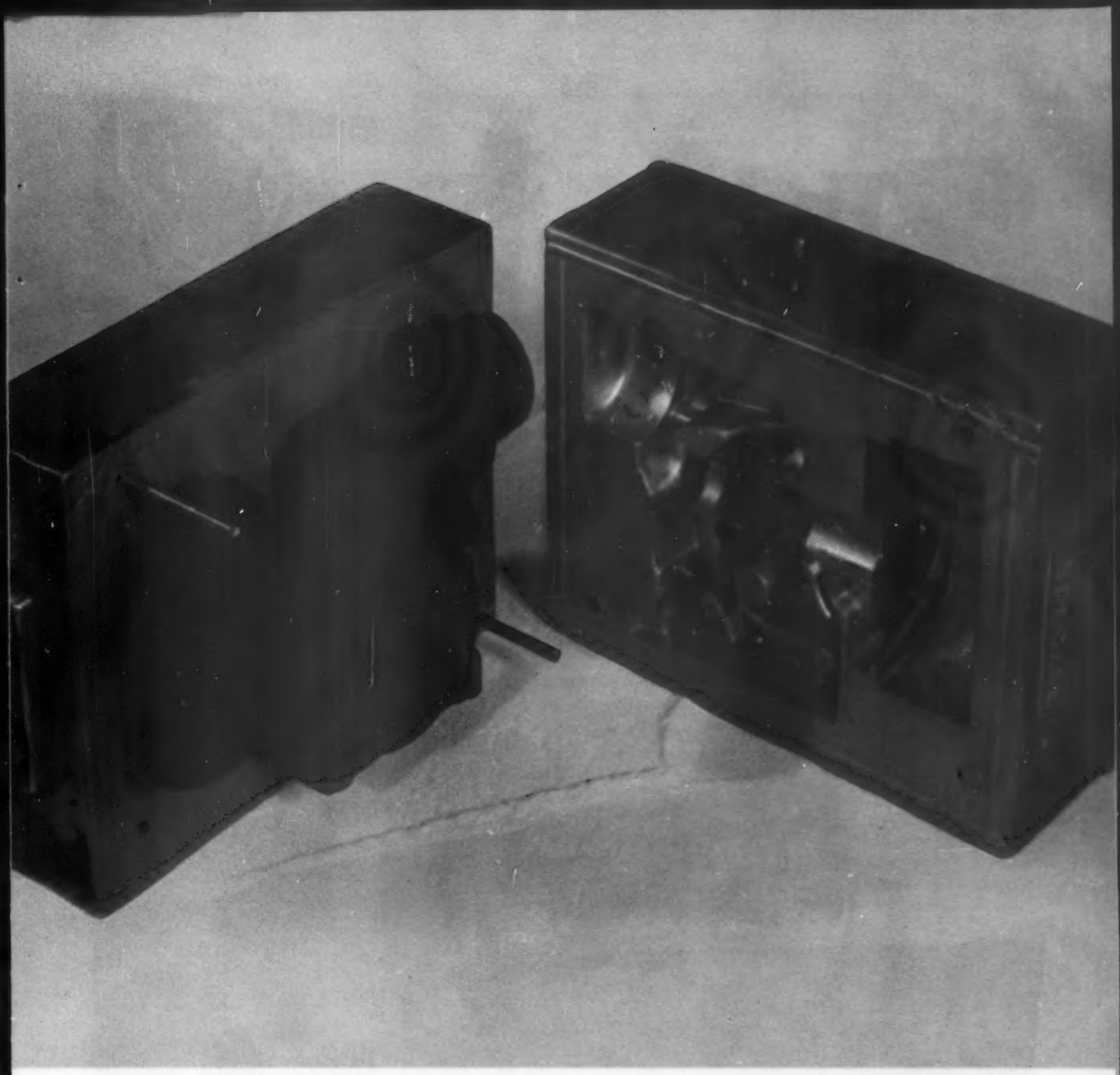
Production Begins in Foundry—The actual fabrication of every product begins in our foundry, which produces more than 100 tons of nonferrous castings monthly and maintains more than 15,000 patterns in stock.

Prior to 1956, we depended on our foundrymen to remember the molding characteristics of each pattern. Supervisors tried to give jobs to the men who handled them before, but in many instances the molders could not recall working on a particular pattern, or the supervisor himself forgot which one of his men previously had been assigned to the job.

About ten years ago, we tried combining conventional photos with data cards, but it was usually several days—sometimes more than a week—before we used up a roll of film and received prints from the

When an order is received from a customer for a certain casting the photo-data card is pulled out of the file, tied to the pattern, and sent along to the foundry

Circle 634 on Page 53→



Save baking time,

mold the best quality cores – use...

DEXOCOR®
and MOGUL®
binders

WRITE OR PHONE

Corn Products for expert technical assistance... helpful data on these fine products for Foundrymen:
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Thor

Everything you want in Air Hoists . . .

and more!

Put a 30 lb. air hoist to work for you which lifts over sixty times its own weight. Easily handled by one man. Infinitely variable speed control from dead slow to 50 ft. per minute lift, 96 ft. per minute descent (1000 lb. model). Pendent or pull-cord control. Hook or trolley mounting. Roller or link chain. Automatic disc brake. 500, 1000, 2000 lb. capacities. Other models to 3 ton capacity. Your Thor factory representative or distributor will demonstrate in your own plant. Thor Power Tool Company, Aurora, Illinois. Branches in all principal cities.

Thor POWER TOOLS

photo-finisher. This meant a time-consuming task trying to match the right photograph with the right card. There also was no assurance at the time a picture was taken that it would be satisfactory.

For these reasons, we dropped the idea of using photographs until late 1956, when we purchased a Polaroid Land camera and started photographing all new castings as well as some of the 15,000 patterns already in stock. To date, we have photo records on more than 3000 of our most active patterns, and every month we add 100 to 150 new or revised photo-data cards to our files.

Photos Ready Promptly — Since each picture is ready a minute after it is taken, we can promptly attach the print to a data card, thus avoiding the possibility of a mix-up. Also, we know immediately if the picture is exposed correctly and if it shows the desired details of the casting.

We estimate the cost of each photo at about 27 cents—approximately $400 a year for our 1500 pictures. By using Polaroid's new high-speed film and its compact "fill-in" light in combination with a yellow filter, we avoid flashlight reflections from the castings but obtain good detail.

Large castings are photographed in the foundry. Smaller castings are brought to my office and placed on a dark pallet on the floor. The pallet provides good contrast for the casting in the finished picture.

After photographing a casting, we attach the photo to a 5 x 7-in. data card containing all the information required by a molder—such as size of flask, sizes of gates and risers, mold hardness, pouring temperature, chill location, etc.

If the casting has a core, we also take a close-up shot of it and attach the print to the back of the data card, which is kept on file in my office until it is required in the foundry. The cards are inserted in acetate sleeves to protect them during their trips through the foundry.

If we have no card for a pattern, we tie a green tag to it; this indicates that the casting should be brought to my office to be photographed before being sent to the machine shop.

The entire data-recording operation takes less than five minutes but it is saving us hundreds of man-hours and thousands of dollars in over-all production costs anually.

DATE 3/23/60 DWG. WT. 2# PATT. A-15453

SYSTEM A B C D

ROTOLIFT ROLL OVER

SQUEEZER BENCH ✓

FLOOR

FLASK POP-OFF

SIZE 11 X14 DRAG 3" COPE 4"

MOLD HARDNESS 40-50

JOLTS SQ. PRESS

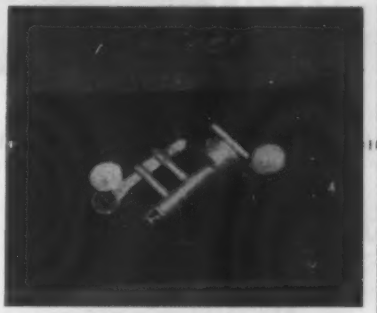
POURING TEMP. 1450° F

MOLDS PER POURING CRUCIBLE

CHILL LOCATION

REMARKS

HEAD TYPE	H	L	W
A 1" ϕ			
B 1¼" ϕ			
C			
D			



This is a duplicate of the actual data card containing certain information necessary to produce a satisfactory casting from the pattern

Aluminum Association Elects Officers at Annual Meeting

M. M. Anderson, an executive vice president, Aluminum Co. of America, Pittsburgh, has been re-elected president of the Aluminum Association. S. D. Den Uyl, board chairman, Bohn Aluminum & Brass Corp., Detroit, was re-elected chairman of the board of directors.

Elected directors - at - large for three-year terms were George A. Ginsburg, United Smelting & Aluminum Co. Inc.; David P. Reynolds, Reynolds Metals Co.; and Lewis P. Favorite, Aluminum Co. of America.

N. H. Collisson, Metals Div., Olin Mathieson Chemical Corp.; John W. Douglas, Republic Foils Inc.; and Thomas D. Gebhart, Anaconda Aluminum Co., were elected vice presidents of the association.

Chairman of the Aluminum Foundry Division is Arthur L. Fischer, Fischer Casting Co. Inc., Dunellen, N. J. Clyde C. Logue Jr., Thompson Ramo Wooldridge Inc., Light Metals Div., Cleveland, was elected vice chairman. The division elected John E. Fahlman, Permold Co., Medina, Ohio, representative to the association's board of directors.

Industrial Programs Offered In Nuclear Technology

The United States Atomic Energy Commission and the University of California at Berkeley will sponsor three courses on radioisotope principles and techniques for management and technical personnel. Industry and AEC representatives will participate as guest lecturers.

An intensive two-week course, June 6-17, on radioisotope theory applications and safe handling is designed to give a broad insight into problems of using radiation in industry and research. A four-week course, June 20 to July 15, is on advanced radioisotope principles and techniques. A survey course to increase management understanding of the basic concepts in radioisotopes and radiation technology will be held July 18-22.

Application blanks and additional information are available from the Engineering and Sciences Extension, University of California, 2451 Bancroft Way, Berkeley 4, Calif.

Your castings carry your reputation...

it pays to find cracks before your customers do

No matter how carefully you control pouring, handling or other processing, cracks and other "invisible" defects are likely to appear in *some* of your castings. You owe it to yourself to find trouble makers as quickly, efficiently and economically as possible.

Not all cracks need rejection—or repair. But cracks in high stressed areas of parts are very serious. Extremely small cracks can cause early failure, if highly stressed!

First, finding all such defects early eliminates bad castings before they go to your buyer or before time is wasted in your own machining or assembly operations.

Second, even *more* important—a defective casting carries with it your reputation and your best chance for repeat business. Can you afford to wait for your customers to test your product for you—especially when you can identify any important defects so easily and economically with Magnaflux Test Systems?

Third, reliable quality is your own best protection against possible conversion from your castings to other means of fabrication. Consistent quality is "job insurance."

Magnaflux testing for magnetic metals and Zyglo for nonmagnetics are easy to use, positive and can save far more than they cost. The critical flaws you need to find appear directly on the part—actually glow with Magnaglo or Zyglo.

Magnaflux-Magnaglo and Zyglo fit into your operations at any point...wherever and whenever this will save you the most money to find and correct the cause of the defects. Many foundries now install Magnaflux or Zyglo "check-points" along their processing set-up to insure the quality and profits of their output—start to finish. For gray iron tests, the $195.00 type Y-5 yoke kit proves extremely useful.

Regardless of the size or kind of castings you make, from ounces to tons, a Magnaflux Nondestructive Testing Engineer can help you meet your planned requirements—for quality, cost—even market expansion. Ask to have him call soon...meanwhile write for data and case studies.

With Magnaglo and black light, any cracks will show up as glowing indications. This casting was proved defect-free.

MAGNAFLUX-MAGNAGLO
For magnetic metals. Prices from $195.

ZYGLO
for nonferrous metals, stainless. Complete kits from $125.

STRESSCOAT
Shows where and how stresses occur, during design or pilot stage.

Y-5 YOKE KIT
Portable, lightweight magnetic particle testing. Complete kit only $195.

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Detroit 11 • Dallas 35 • Los Angeles 22

The Hallmark of Quality in nondestructive test systems

The Sandman Says

By HAROLD E. HENDERSON
H. C. Macaulay Foundry Co.
Berkeley, Calif.

"Sand Control"

● PERHAPS I'm being hypercritical, but I've never been quite satisfied with the term "sand control." It presupposes a condition that has never been achieved, nor is it likely to be.

It unquestionably describes a condition that is desirable, a goal, a target to shoot at—even a brightly shining ideal, which Webster defines as "something existing in imagination or fancy only." It might be said to resemble the star by which the mariner steers.

I do not mean to sound pessimistic, nor do I seek to discourage those who devote all of the energy of their waking hours to the problems which beset the man at the muller. Within definite and definable limitations which he inherited, and over which he has but a minimum of control, he may be doing an excellent job and yet continue to be the subject of humiliating castigation.

The variables which affect his daily performance are innumerable. They may operate separately or in combination. Some of them are quite obvious to the experienced eye. Others defy even the experts.

We've Learned Something—Twenty-five years of synthetic sand study and practice has inevitably resulted in a gratifying amount of gain in practical knowledge of this subject. We should be ashamed if it hadn't. We have obtained a measure of control which is clearly reflected in the quality, quantity, and intricacy of today's castings. We have reached the highest level in commercial foundry practice ever achieved, and this despite all arguments of the old-timers to the contrary.

But as progress begets progress, we raise our sights to more distant and more difficult targets. We become dissatisfied with a performance that would have filled the old-timer's heart with joy. Castings are scrapped which once would have been displayed with pride. Casting specifications have become increasingly critical, and the sandman is expected to produce a molding material that will satisfy such stringent requirements, despite the fact that his basic materials are unsuitable and his sand-conditioning equipment inadequate for such an assignment.

Yet despite the odds, the battle continues. From time to time management loosens its purse strings, and a new and better muller is purchased, a larger and more efficient aerator, better screening devices, and perhaps even a more suitable base sand are acquired. These purchases are reflected in an upward quality trend, and quite likely a greater degree of control is obtained. I repeat, a greater degree, not *absolute* control.

A Case in Point—Let's drop the generalities and become specific, posing a hypothetical case which you and I will recognize as entirely categorical in altogether too many foundries in the world today. The shop of which we are speaking shall mercifully be kept anonymous, for we are not trying to add insult to injury.

Five grades of sand are employed

It is no longer necessary for you to buy and use general purpose metal abrasives on the basis of claims made by its manufacturers of its performance in other plants.

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MALLEABRASIVE

in this shop. Using the rather dubious AFS grain-fineness numbers, they can be listed as 41, 47, 60, 70, and 130. Nos. 130 and 70 are used sparingly, due to cost, in special core mixes. No. 60 becomes the base for all green sand in the shop, and a small amount of it also is used in core mixes, principally because it contains some clay and aids the cereal in developing green strength.

Nos. 47 and 41 dominate the brick and general run of cores. These two sands are almost identical, and although No. 47 might be preferred because it is cleaner and is delivered dry, the coarser sand shows a saving of $2 a ton, has a higher permeability, and requires less core oil. This No. 41 also is the base for all dry-sand work.

The No. 60, with its small amount of clay and attractively low price, serves as system sand for all green molds for castings up to 500 lb in weight. When worked in its best condition — at optimum moisture and uncontaminated—casting finish has been pronounced excellent. This is proudly termed "control." But this pride also goeth before a fall.

Something Has Changed—Castings may, and frequently do, become rougher without warning. Everyone maintains a discreet silence, hoping that the disease will run its course and disappear. But this doesn't happen; it gets worse. Then voices are raised: "Where is your vaunted control?" The muller-man has made no change whatever in his mix, at least none that he is aware of. Aside from slightly more of the coarser grains and an increase in permeability, the test result is unchanged. The muller-man did not knowingly add this coarser material; it just sneaked in when he wasn't looking.

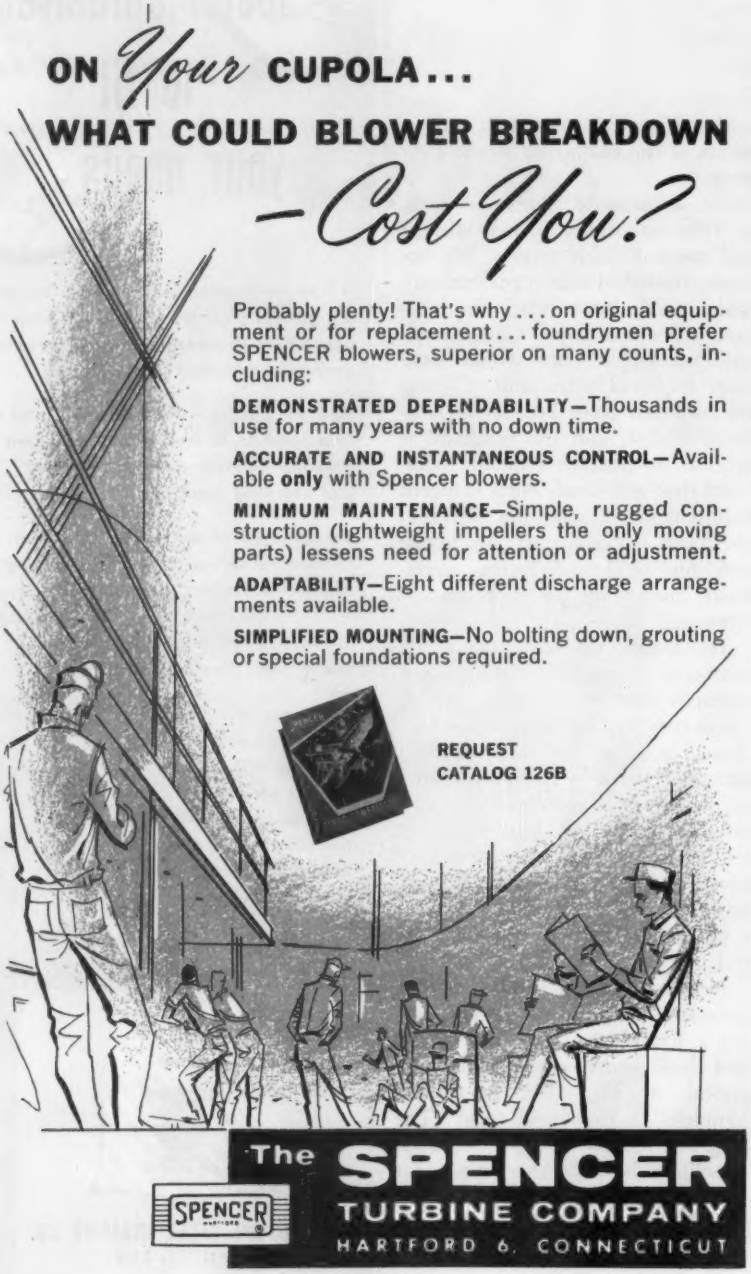
Although all molds were shaken out by hand, and care taken to remove core butts, there was still a certain amount of burned core sand, Nos. 41 and 47, dribbling into the system in direct proportion to the number of cores used and the quantity of molten iron surrounding them.

In addition to this source of contamination, there was another of even more ominous proportion. On certain work, patterns were covered some 3 in. deep with dry-sand facing (a No. 41 base sand), and the rest of the mold was backed with fine system sand. These molds were wet-blackened and dried (baked). At the shakeout this conglomeration was all tabbed "system," due to ignorance or apathy on the part of the night men, and the casting finish suffered accordingly.

It probably wouldn't happen anywhere else, but in this shop—which shall continue to remain nameless —the night crew was instructed, warned, cajoled, and threatened, yet the careless practice persisted. If the threats were sufficiently menacing, the boys might follow instructions carefully for a week or so, keeping all suspected coarse sand out of the system, but old habits require less effort and are hard to break, so again the complaint is heard, "What in hell are you doing to that sand?"

Try Anything!—A true remedy for any disease may be difficult to obtain but there is always a palliative—rub salve on the sore, drink an alkalizer, sit on a hot plate, try anything! Something is bound to work.

Too much of our so-called sand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FEDERATED METALS DIVISION

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control is determined by similar logic. In the case of the contaminated system, we might wash, dry, and screen all returns, thus eliminating the offending coarse material. Or we could discard the entire mess and start over with all new fine sand. The first method suggested is prohibitively costly for the average foundry, and I would not recommend the second one for various reasons which any experienced foundryman will appreciate.

Our alternative in this case then is to resort to a palliative, namely a healthy addition of very fine sand, probably a No. 130 or even finer, in the hope that when enough has been added, a desired casting finish might be restored. But let's not be overoptimistic. While coarse grains are present, even to a minor extent, our castings will betray their presence.

It is the considered opinion of most sandmen that where several types of sand are in use, they should be kept segregated at all costs, or at least to the extent that is practical. Special storage, effective machinery, and intelligent effort should be employed to protect these dissimilar materials. A suggestion—which most of us believe to be impractical under our present setup—nevertheless is one which possesses potential merit, namely, the use of a single type of sand for all work—cores and molds—thus banishing chances of a coarsening contaminant.

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produces temperatures never before achieved with oil or natural gas. Burning oil, it can reach a searing 3450°F. On 1000 BTU/cu. ft. natural gas, it develops 3320°F. Both these extremely high temperatures are close to the theoretical limits for these two fuels. Foundries, smelters, heat treaters and other metal processers have been quick to take advantage of the remarkable combustion efficiency of these new burners. To them, it has meant faster heating cycles, cleaner flue gases, and above all, fuel economy that cuts from 12% to 30% from their furnace overhead. Not to speak of reduced maintenance on refractory linings.

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New Jersey Zinc Co. Sponsors Zinc Diecasting Contest

New Jersey Zinc Co., New York, is sponsoring a $1000 cash award entitled "The New Jersey Zinc Co. Zinc Die Casting of the Year Award" in recognition of important contributions made by diecasting engineers to the industry.

All producers of zinc diecastings are invited to enter the competition, and the award will be made to the person who contributed most to the successful design and production of the winning part, as reported with the entry. Award presentation will be made September 14 at the annual dinner of the American Die Casting Institute at the Edgewater Beach Hotel, Chicago.

Any number of entries can be submitted, provided castings were made after May 1, 1959. The competition closes midnight, July 31, 1960. Further information and entry forms can be obtained from the Market Development Div., New Jersey Zinc Co., 160 Front St., New York 38, N. Y.

Booklet on Photomicrography Issued by Eastman Kodak Co.

A 46-page data book for metallurgists, "Photomicrography of Metals," contains six major sections which include detailed information on the metallograph microscope, illumination, filters in metallography, photographic materials, exposure determination, and processing and printing.

Offered by Eastman Kodak Co., the guide is illustrated with photographs, charts, and graphs.

Copies can be obtained from the Sales Service Div., Eastman Kodak Co., Rochester 4, N. Y., for 50 cents each plus 10 cents for handling.

New Tabor Cut-Off reduces Foundry costs

Tabor-Brasive Double-Duty Cut-Off with new Swing-Frame feature, being shown for the first time at 1960 Foundry Show

Now! Tabor combines a table type Cut-Off with a Swing-Frame to help reduce foundry costs. The new Swing-Frame Feature is available on all standard table type Tabor-Brasive Cut-Offs.

Any alloy steel, nodular and ductile iron, or conventional foundry metal can be cut easily with the Tabor Swing-Frame. Operation is simple. Just pivot the head inside the ring, or rotate the entire head, and you are ready to cut. With the Tabor Swing-Frame, castings can be cut at any angle.

The Tabor Swing-Frame means there is less equipment to buy, less floor space is required, and maintenance is reduced.

Ask your Tabor Man to show you how the new Tabor Swing-Frame can cut *your* foundry costs. Call him now, or write for information.

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AFS Congress

Technical Reports

Summaries of papers and discussions presented at the recent AFS Castings Congress are completed with this issue. Reports published in the June issue covered sessions on Brass and Bronze, Light Metals, Malleable Iron, Ductile Iron, Industrial Engineering and Costs, Plant and Plant Equipment, Management Development, and Safety, Hygiene and Air Pollution

GRAY IRON

● GRAY IRON foundrymen covered a broad range of topics in four technical sessions, two shop courses, and at a roundtable luncheon held jointly with the Ductile Iron Division.

Consideration was given to microstructural changes, impact tests, feeding distance of risers, cupola operation, heat treatment, ladle additions, effect of inoculation, and scrap metal for iron foundry use. Papers at the technical sessions included:

Microstructural Changes Upon Tempering Nickel Chromium White Iron at 400° F, by J. R. Mihalisin and R. D. Schelleng, International Nickel Co. Inc., Bayonne, N. J. Presented by Mr. Schelleng. Early in the development of Ni-Cr martensitic white irons it was found that heat treatment at 400° F for about 4 hours resulted in an appreciable increase in toughness without any sacrifice in wear resistance.

Examination of the polished and etched specimens under the commonly used light microscope did not reveal any marked change in microstructure which would account for the increase in toughness. Examination under polarized light, however, indicated that change had occurred, and further study under the electron microscope showed a lamellar precipitation of a second phase within the martensite plates.

Particles of the second phase were removed and an electron diffraction pattern obtained which indicated that the phase was epsilon carbide. Conclusion was that precipitation of epsilon carbide permitted the highly strained tetragonal lattice of martensite to relax and form cubic martensite, resulting in the increase in toughness.

Gray Cast Iron Charpy Impact Test and Impact Modulus, by Albert de Sy, University of Ghent, Ghent, Belgium. Investigation of impact testing of unnotched cylindrical gray cast iron test pieces showed a scatter

Photo courtesy of United Air Lines

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Want to see how it's done? A colorful brochure and a film strip describing this service system are available through your local Clark dealer. You'll find him listed in the yellow pages under "Trucks, Industrial." Or, if you prefer, write direct to: Clark Parts Service, Clark Equipment Company, Battle Creek, Michigan.

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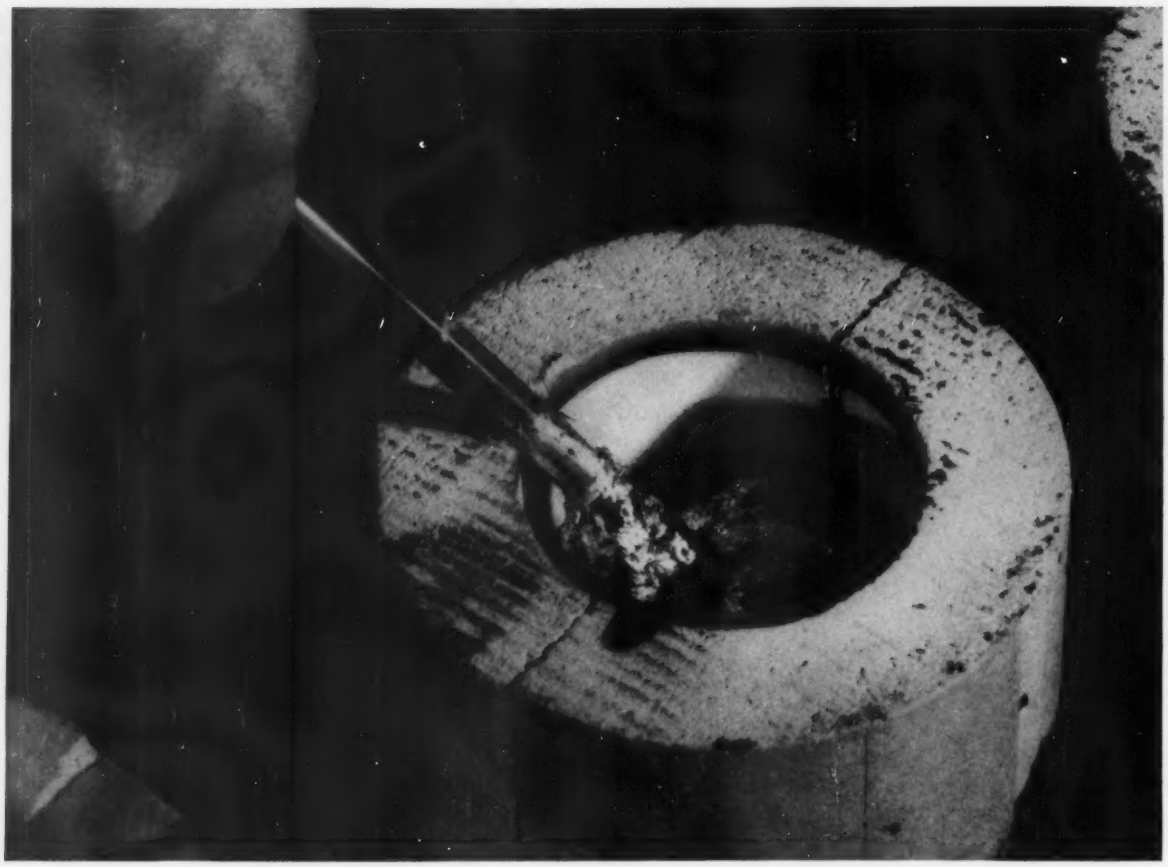

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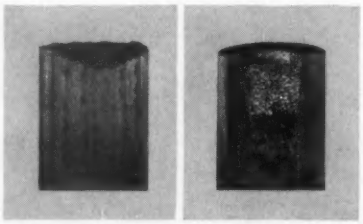
THE INSULATED RISER SLEEVE FOR NON-FERROUS METALS THAT ASSURES UNIFORM FEEDBACK TO EVERY PART OF THE MOLD

Now you can get perfect finished castings every time with Johns-Manville Ris-A-Sleev®, the new riser sleeve that cuts heat transfer in half. The heat is contained *in the sleeve,* keeping the metal molten twice as long as the most effective competitive product. This allows more time to complete feed-back.

Ris-A-Sleev's more effective insulation serves to reduce the size of the risers, thereby giving you closer control of solidification. What's more, smaller risers mean a big reduction in cut-off waste. The following photographs graphically demonstrate Ris-A-Sleev's superiority over a leading competitive product.



Under identical test conditions, brass pourings were made with a Ris-A-Sleev and an ordinary riser sleeve. Note how riser metal from the mold equipped with a Ris-A-Sleev (left) has solidified uniformly with very little concavity, indicating uniform feedback to mold. Then note how the riser from mold using competitive sleeve (right) has cooled quickly around circumference, while center of riser stayed molten, resulting in pronounced concavity and uneven feedback.

Try Johns-Manville Ris-A-Sleev and discover the economic way to improve bronze, brass and aluminum castings. They are available in a complete range of sizes. For full information write Johns-Manville, Box 14, New York 16, N. Y. Ask for brochure IN-247A.

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Circle 642 on Page 53

of 4 to 12 per cent which would indicate that the average of four impact tests would be comparable in accuracy to a single tensile test.

Impact resistance, expressed as energy of rupture per unit volume and measured on an unnotched cylindrical test piece belonging to the proportional series $L = 5D + 1D$, is a characteristic of the material and may be called the "impact modulus." In the equation, L is the total length, 5D the distance between supports, and D is the diameter.

Accuracy of the test is acceptable for practical purposes where at least 40 per cent of the pendulum energy is used, and the striking velocity is between 2 and 4 meters (6.6 and 13 ft) per second.

Machinability of Cast Iron by Jan van Eeghem, University of Ghent, Ghent, Belgium. Specimens used in the tests were hollow cylinders 8¾ in. OD, 7¼ in. ID and 18 in. long. Addition of 2 per cent Cu and 0.25 per cent Cr to the irons used, which did not change the Brinell hardness, permitted higher machining rates.

Feeding Distance of Risers for Gray Iron Castings, by G. K. Turnbull, H. D. Merchant, and J. F. Wallace, Case Institute of Technology, Cleveland.

This was a progress report on work sponsored at Case Institute by the AFS under the direction of the Gray Iron Division research committee. Knowledge of feeding distance of gray iron castings will aid in the selection of proper location and number of risers to be used. To minimize mold wall movement, rigid molds were used in the study of feeding distances. The work developed these conclusions:

1. Feeding distance of adequate risers is unlimited when applied to simple, uniform-sectioned gray iron castings of all unalloyed, hypoeutectic gray iron cast in rigid molds.

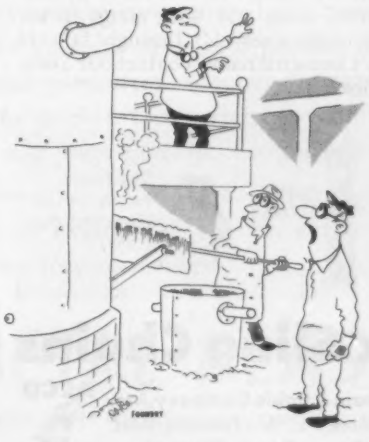
2. Appearance of the risers in this investigation confirms the fact that some riser volume is necessary to compensate for liquid shrinkage in cooling from the pouring temperature to liquidus temperature. The solidification contraction accompanying the austenitic dendritic solidification also requires compensation. The amount of solidification contraction increases as the carbon equivalent decreases.

Operating Experience With a Lingless Water-Cooled Cupola, by M. E. Rollman and D. J. Tusack, Cincinnati Milling Machine Co., Cincinnati. This installation, described in detail in May FOUNDRY, achieves excellent carbon control of the metal, has reduced silicon losses about two-thirds of the former loss in basic melting, has cut coke consumption 15 per cent, and reduced refractory cost from $4.50 a ton of iron to less than 25 cents a ton.

Heat Treatment of Cast Iron, by P. H. Dirom Jr., Lynchburg Foundry Co., Lynchburg, Va. Stress relieving is the most widely used heat treatment at this foundry. Stress relieving at 1050° F removes internal casting stresses. Higher temperature stress relieving, 1150-1200° F, removes internal stresses and improves uniformity of hardness in alloy iron castings.

Annealing at 1250-1450° F is used for ductile iron castings containing no carbides (cementite) as cast. Castings which contain carbides as cast are annealed at 1650° F. Lynchburg uses normalizing for ductile iron castings only. The treatment—heating to 1650° F and air cooling to 1450° F—produces a structure of 70-80 per cent pearlite in castings which contain excessive cementite or ferrite as cast.

Another treatment employed is quenching castings at 1650° F in oil followed by tempering at 900-1200° F. Tempering at different temperatures within that range produces the desired structure and hardness.



"Never mind the countdown—get that metal out!"

Ladle Additions to Hypoeutectic Gray Cast Iron, by D. D. McGrady, H. L. Womochel, Michigan State University, East Lansing, Mich.; C. L. Langenberg, Oldsmobile Div., GMC, Lansing, and D. J. Harvey General Motors Research Laboratory, Detroit. Presented by Mr. McGrady. This progress report on research, started 15 years ago at Michigan State University, presents the following observations on late additions which were made to hypoeutectic gray iron:

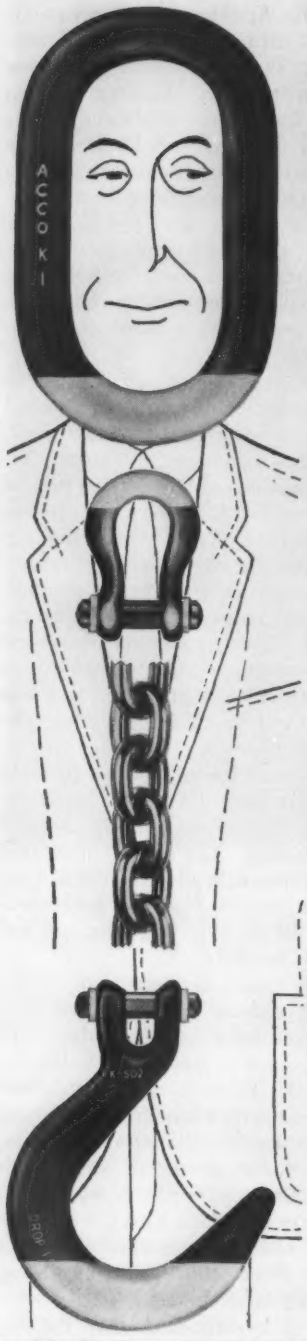
1. Pure silicon was not effective in altering the properties or microstructure in a favorable manner. 2. Aluminum was ineffective in improving the transverse properties of the iron but was effective in reducing chilling tendency. 3. Graphite produced improvements in mechanical properties and graphite distribution and reduced chilling tendency. 4. Metallic calcium produced marked improvement in graphite distribution and mechanical properties and was effective in reducing chilling tendency.

Effect of Inoculation on Risering of Gray Iron, by H. D. Merchant and J. F. Wallace, Case Institute of Technology, Cleveland. Presented by Professor Wallace. This is a research progress report on work sponsored by the AFS Training and Research Institute.

The reason for increased shrinkage or risering requirements of gray iron resulting from inoculation of iron poured in green sand molds was studied. Effective inoculation was obtained with ferrosilicon containing appreciable aluminum and calcium, and aluminum metal added with ferrosilicon; pure silicon was an ineffective inoculant. Effective inoculation produced considerable mold wall movement, thus increasing risering requirements.

It is hypothesized that the inoculation produces a mushy type of solidification and delays formation of a solid metal skin. This results in a weak casting wall and confined internal pressure, producing mold cavity enlargement.

Hot Blast in Gray Iron Melting—a symposium having the following panel members: W. J. Sommer, Plainville Casting Co., Plainville, Conn.; D. B. Ziegler, W. O. Larson Foundry Co., Grafton, Ohio; T. Giszczak, Central Foundry Div., General Motors Corp., Defiance,



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Ohio; and R. L. Dekker, J. B. Clow & Sons Inc., Bensenville, Ill.

Each panelist highlighted experiences his company has had in operation of hot blast cupolas. There was general agreement that certain operating economies and production efficiencies have resulted. Reduced maintenance, longer lining life, faster melt, less coke, less flux, increased flexibility, and closer metallurgical control were some of the advantages cited.

Changes in charge composition have resulted from use of hot blast. Through the substitution of scrap, melting costs have been reduced and substantial savings made.

All panelists warned that instant control at all points of the operation are required with this technique to make it perform most efficiently.

Authors Receive Awards

At the joint Gray Iron and Ductile Iron Divisions roundtable luncheon, awards were presented to the authors of the most significant paper given at this year's Gray Iron Division sessions. Harvey E. Henderson, vice chairman of the division's executive committee, presented the awards to D. D. McGrady, H. L. Womochel, C. L. Langenberg, and D. J. Harvey for their paper, "Ladle Additions to Hypoeutectic Gray Cast Iron."

The luncheon speaker was W. S. Story, Institute of Scrap and Steel, Washington, who discussed **Scrap Metal for Iron Foundry Use.** Gross annual sales of purchased scrap are about $2 billion, and total markets range from 28 to 36 million tons annually, including export.

Steel industry developments which have affected the scrap industry adversely are an increase in blast furnace capacity, making more pig iron available; the charging of iron ore directly into the furnace, and the basic oxygen converter for steelmaking.

Consequently, scrap processors are giving more attention to other competitive aspects such as quality, delivery, and special preparation for special customers. Attempts are being made to provide a cleaner, more standardized product.

The gray iron shop course consisted of two lectures on the **Fundamental Behavior of Gray Iron,** presented by H. L. Womochel, Michigan State University. In the first

nothing tricky about it!

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lecture, the speaker discussed iron, carbon, and silicon, their behavior, mode of solidification, and their influence on fluidity. In the second lecture, shrinkage and mold wall movement, feeding distances, mechanical properties, and structures were considered.

DIECASTING & PERMANENT MOLDS

● TECHNICAL PROGRAM of the Diecasting and Permanent Mold Division was made up of three technical sessions and a joint luncheon with the Light Metals Division. Subjects discussed included aluminum engines, ultra-high pressure casting, die steels, metal handling, British aluminum diecasting and permanent mold casting, low-pressure permanent mold casting, grain refinement of aluminum alloys, and a high-silicon aluminum alloy.

At the joint light metals and diecasting luncheon, two speakers discussed "The Aluminum Engine," one from the designer's point of view and the other from the foundryman's. An audience of more than 200 heard these talks.

The Designer Looks at the Aluminum Engine, by B. J. Mitchell, General Motors Corp. Technical Center, Detroit. A change from cast iron to aluminum automotive engines is attractive to designers because of the weight reduction such a conversion would permit. This reduction would involve the entire surrounding structure, not only the engine, and would permit operating and construction economies, both of which are desirable.

Production of automotive blocks as aluminum sand castings presents certain difficulties to the designers, such as casting thin enough sections to take full advantage of the potential weight reduction. Designers therefore think of the aluminum engine in terms of metal mold casting, particularly diecasting.

To produce a satisfactory aluminum block, however, diecasters need to improve their process in a number of respects. These include the use of less metal, reduction of draft to permit greater design freedom, better yield, lower price, freedom from porosity, faster cycling time, and longer die life. In addition, diecastings must offer assured uniform properties. To permit thin sections, tensile strengths must be in the range of 15-20,000 psi. In addition, a cheaper method of making prototype diecastings is necessary.

Production of an aluminum engine will require the full co-operation of all persons concerned. Casting of aluminum will have to make the transition from an art to a science.

The Foundryman Looks at the Aluminum Engine, by J. Smith, Aluminum Co. of America, Cleveland. Much work has been done to develop automotive applications for aluminum, and those who have done it cannot afford the production of poor castings which might wreck the prospects of the aluminum engine.

To assure that castings are well made and properly designed, it will be necessary to use brittle lacquer and strain gage tests. Test bars are valuable, but do not reflect actual properties of the castings adequately.

Selection of the process to make the aluminum engine castings will be based on economy: The cheapest way to make enough castings fast enough and well enough will be chosen.

Diecasting is the most suitable for thin sections, but permanent mold castings are preferable for heavier sections and for soundness. If neither will do the job, both semipermanent mold and sand castings will be considered.

The application of automated equipment in sand foundries is arousing new interest in the sand casting process despite such drawbacks as heavy section thicknesses, rougher finish, and low yields. Sand casting still is the most versatile casting method. Its use requires that castings be designed for easy molding and cleaning. Each of the various casting methods has advantages and disadvantages involving coring methods, finish, yield, machining, etc.

Diecasting has the lowest casting cost for automotive runs. It may be possible to make cylinder heads in parts as diecastings, then to join the parts with an adhesive or by brazing. For the present, however, both heads and manifolds will have to be made as sand or semipermanent mold castings.

To make aluminum castings for automotive applications, the foundryman requires straight parting lines, no deep coring, no abrupt section changes, and agreement as to locating points.

A Fundamental Review of Diecasting Die Steels, Their Heat Treatment, and Related Problems, by D. R. Edgerton and N. O. Kates, Lindberg Steel Treating Co., Melrose Park, Ill. Presented by Mr. Edgerton. The ideal material for die cavities should resist thermal erosion and shock erosion and be machinable while hardened, but no such material yet is available to diecasters.

It is necessary to settle for approximations of the ideal, such as P-20 for zinc and low-melting-point alloys, H-11, H-12, H-13, and H-14 for aluminum and magnesium and their alloys, and H-20 and H-21 for brass and its alloys. SAE 4140 is well suited for holding blocks.

Basic principles of heat treatment require that a die be properly supported, that it be held long enough at temperature, and that it be cooled at a proper rate.

The casting producer should use a reliable supplier, design the die properly, co-operate with the forger and the heat treater, and avoid abuse of the die. Common types of die failure include cracking, heat checking, pitting, and soldering.

Corrosion Fatigue in Two Hot Work Die Steels, by D. N. Williams, M. L. Kohn, R. M. Evans, and R. I. Jaffee, Battelle Memorial Institute, Columbus, Ohio. Presented by Mr. Williams, based on work done for the Die Casting Research Foundation. This study used a cantilever-type fatigue machine to stress sheets of die steel at about 1100° F, at 5 to 100 cycles a minute.

The steels tested were H-21 and H-23, each in hardened and annealed conditions. A statistical approach was used. Tests indicated that oxidation played no part in the

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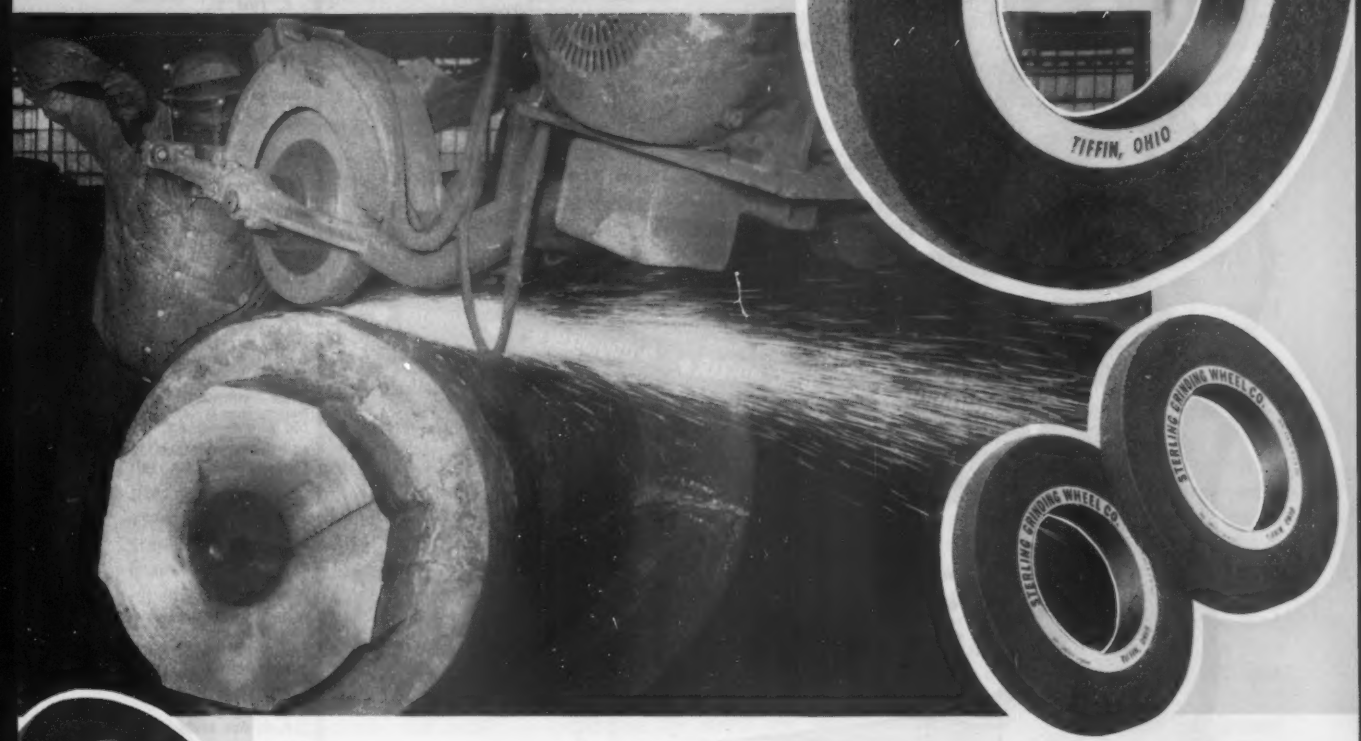

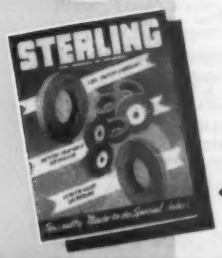

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life of samples. Plastic strain, cycle speed, and temperature are the causes of shortened die life. Heat treatment prolongs die life only because of resistance to strain it creates. Anything which reduces strain helps to prolong die life. Dies are exposed to temperature cycling, and if they are held rigidly, they undergo elastic and plastic strain. Elastic strain resistance depends on yield strength of the material.

Ultra-High Pressure Casting, by J. L. Reiss and E. C. Kron, Doehler-Jarvis Div., National Lead Co., Toledo, Ohio. Presented by Mr. Kron. Pressures used in the work under discussion ranged from atmospheric pressure to 100,000 psi. Metal was air-melted, vacuum-degassed 356 alloy.

Pressure was greatest on the first metal to solidify and was negligible on the last. All metal cast at 50,000 to 100,000 psi was completely sound. Castings made at less than 10,000 psi were sound except at the top. At 10,000 psi, castings contained defects. Vacuum degassing improved the properties of castings at both atmospheric pressure and high pressures. No pressure was applied until 5 seconds after pouring. This method produced elongations up to 17 or 18 per cent. At 30 seconds, the metal solidified and actually was hot worked.

At 50,000 psi, tensile and yield strengths were improved, and ductility was increased considerably. Surface finish was a perfect reproduction of the mold, with no unsoundness and no dendritic grain. Silicon was dispersed finely, and density was better.

In a written discussion, D. L. LaVelle, Federated Metals Div., American Smelting & Refining Co., New York, stated that the application of high pressure will not produce notable improvement in any casting property except elongation. The process is hot forging, he said, and is difficult to apply to castings other than round and rectangular test pieces.

Molten Metal Handling in Diecasting Plants, by V. D. Sweeney, Metal Pumping Services Inc., Cleveland. Handling of molten metal is of particular importance in diecasting plants, in which metal demand is high, metal is transferred, and segregation must be avoided.

Manual handling is difficult, and such methods as use of siphons or launders present one or more drawbacks. Pumping, on the other hand, overcomes the problems of gravity, inconvenient placement of equipment, and others. Pumps can be turned on and off quickly, and iron pumps can be frozen in metal. They simplify the metal handling job and are both less time consuming and less hazardous.

A Brief Outline of British Diecasting Practice in Aluminum Alloys, by R. R. Woodward and H. J. Profitt, High Duty Alloys Ltd., Buckinghamshire, England. Presented by Mr. Profitt. In England, permanent mold castings often are used for applications in which diecastings would be used in the United States, chiefly because diecasting dies are expensive. Both sand and permanent mold casting are more common than diecasting. The latter is employed where it is economically justifiable and the need for surface finish calls for it. Permanent molding can produce adequate finish for most jobs, however, and, like sand casting, gives better soundness.

In England, diecasting machines range from 75 to 1200 tons, but very few are over 500-ton capacity. Because few large machines are available, dies tend to be smaller for a given casting to enable them to get through the tiebars. Machines frequently are overloaded.

Expensive die steels are used in the die cavity, with cheaper material for the holding block. Cavities are designed to fit standard housings so that one block can be used with various cavities.

"The heat will be ready when your pants start to smoke"

Aluminum diecastings are used in the as-cast condition. High-silicon alloy is preferred—usually 10 per cent Si, 1.5 per cent Cu, 1 per cent Fe max, and 1 per cent Zn max.

Permanent mold foundries use multi-impression dies with mechanical opening and closing. Power ejection facilitates removal of castings from dies, and dwell time is governed automatically. Many techniques are used to achieve progressive, directional solidification to reduce riser sizes. Directional solidification has reduced remelt to as much as 25 per cent of the original amount. Most popular permanent mold alloy is 5 per cent Si, 3 per cent Cu, 0.5 per cent Mg, and 0.4 per cent Zn max.

Low-Pressure Die Casting, by E. C. Lewis, Alumasc Ltd., Northhamptonshire, England. Presented by D. L. Colwell, Apex Smelting Co., Cleveland. Essentially, this process holds metal in a hermetically sealed crucible and sends it under pressure through a tube to the bottom of a permanent mold in which it rises and is held. Pressure varies from 2.5 to 10 psi. Completely sound castings weighing up to 80 lb have been produced, even with heavy bosses on top. Good quality soft gray iron is the best mold material, and the most satisfactory alloy for this type of casting contains 11 per cent Si.

Chief advantages of the process involve soundness and yield. This process raises the 40 per cent typical permanent mold yield to almost 100 per cent. In addition, the process provides good working conditions and easily can be mechanized.

Drawbacks include the fact that the process is not economical for all types of castings, especially where section changes are abrupt, or for all alloys. No sand cores or multipart metal cores can be used. Freezing time is relatively long, the ingate may freeze, and cycle time is longer than with permanent molding.

Low-Pressure Permanent Mold Casting of Aluminum, by D. J. Flynn, Chevrolet Div., General Motors Corp., Massena, N. Y. Installation of the low-pressure process at Massena was difficult because of a combination of factors including newness of the plant, use of untrained employees, and production deadlines for a new car.

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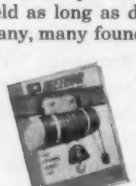

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and closing equipment; it has insignificant gates, runners, and sprues, and saves on finishing. Yields at Massena run as high as more than 95 per cent. Most castings require only that the small gate be cut off. Longest cycle is for the cylinder head casting, which requires 3 psi for 5 minutes plus 2 minutes solidification time.

Attempts have been made to set up automatic controls, but some problems still must be worked out, such as metal supply, ingate freezing, and improved coating practice. The alloy used is 356, and all castings but one are aged artificially at 400° F for 4 hours.

Shrinkage and porosity have been eliminated almost entirely, and mold coatings have been developed to a point where twice as many castings are obtained per coating as were originally. Both cast iron and steel dies are used.

Aluminum Casting Alloys Improvement by Grain Refinement, by K. Schneider, Aluminiumwerke Nuernberg G.m.b.H., Nuernberg, Germany. Aluminum alloys solidified with a fine grain show 8 to 10 per cent better tensile strength and elongation than those with coarse grains. What agent is used to achieve fine grain depends on the alloy involved. Some success has been achieved in developing grain refining methods for hypereutectic aluminum-silicon and aluminum-magnesium alloys.

The best method for hypereutectic aluminum-silicon alloys is treatment with a mixture of red phosphorus, potassium chloride, and potassium-titanium fluoride. Edge length of the salt crystals in the refining medium should be between 20 to 60 mu. The salt treatment is followed with chlorine fluxing.

Alloys containing 2 to 8.5 per cent magnesium are treated with carbon tetrachloride, which is introduced into the melt with nitrogen as a carrier gas. Small amounts of titanium (0.2 per cent max) and boron (about 0.0005 per cent) must be present in these alloys.

Aluminum Alloy with High Silicon Content, by E. E. Stonebrook, Aluminum Co. of America, Cleveland. Alloy X393 diecastings were developed to satisfy the requirements of parts subjected to wear while retaining satisfactory castability and machinability. Nominal

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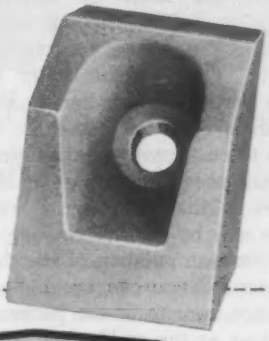

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composition is 19 per cent Si, 0.6 per cent Cu, 1 per cent Mg, and 0.4 per cent Mn.

Hypereutectic aluminum-silicon alloys have been used to a limited extent for many years, but better casting characteristics, machinability, mechanical properties, homogeneity of structure, and thermal conductivity have favored the use of hypoeutectic alloys such as A132, 355, and 380. Adoption of phosphorus refinement of primary silicon crystals in the hypereutectic alloys with accompanying improvement in machinability and reduction in segregation have stimulated renewed interest in these alloys because of the need for more wear resistance in certain types of cast components.

Alloy X392 currently is being used for production of commercial diecastings and experimental sand and permanent mold castings. Parts which appear to be potential applications for diecastings in this alloy are cylinder liners, cylinder blocks, brake drums, clutch plates, sheaves, and pulleys.

CORE and MOLDING SAND

● FIVE technical sessions, a dinner meeting, and one shop course made up the Sand Division program. It covered many aspects of sand practice. The shop course was a panel presentation on "New Horizons in Sand Practice" at which panelists discussed green sand, air setting binders, and shell molding.

Parashrinkage Phenomena: Veining, Metal Penetration, Scabbing, Hot Tearing, by D. C. Williams, Ohio State University, Columbus, Ohio. A hot spot is composed of two immediately adjacent parts: 1. A restricted volume of sand mass anywhere on the mold-metal interface with temperature raised above the level of surrounding masses. 2. The thermal center of a solidifying mass in a casting section. The thermal center is the last portion of a section to solidify.

Shrinkage can develop within the thermal center, and veining and metal penetration may be derivatives of that shrinkage. Scabbing also may be a derivative, one which proper manipulation of the thermal center location can avoid. Rat tails do not seem to fit the pattern. Reactions at the mold-metal interface determine the type of defect which occurs. If the thermal junction comes in contact with the mold-metal interface and melt quality is poor, a defect occurs.

Study of Surface Area Measurements and Theoretical and Experimental Relation to Angularity and Shape Factors in Foundry Sands, by G. J. Vingas and A. H. Zrimsek, Magnet Cove Barium Corp., Arlington Heights, Ill. Presented by Mr. Vingas. Angularity factors based on actual surface area and theoretical surface area cannot be used to describe the shape of sands. This method cannot distinguish either theoretically or experimentally between simple geometrical shapes and should not be expected to distinguish between the more complex shapes of foundry sands.

Specific factors or shape numbers cannot give a comprehensive figure describing sand shapes. They are of more value when computing energy exerted for new surfaces produced in grinding or crushing operations. The air permeability method gives a relative value controlled by bed height and percentage of porosity. Care should be taken to check these points accurately, for they greatly overshadow surface area measurements. The microscope still is the only means to check angularity. It is recommended that angularity be checked by ten photos in the same fashion that grain size is depicted for steel or graphite shape for gray iron.

In a written discussion, Dr. W. K. Bock, National Malleable & Steel Castings Co., Cleveland, stated that it is possible to group shapes by calculations, but not to distinguish between shapes. He agreed with the authors, but not with some of their assumptions.

Victor M. Rowell, Archer-Daniels-Midland Co., Cleveland, agreed with Dr. Bock that it is difficult to measure something when it cannot be identified. He suggested that most persons are accustomed to looking at sand under a microscope. Mr. Rowell found a correlation between visual classification and angularity factors based on actual surface area and theoretical surface area. Three written discussions were submitted by Dr. F. Hoffman, who developed the formula for angularity based on actual and theoretical surface areas, but they were not presented at the session.

Canadian Nonferrous and Iron Foundry Sand Practice Survey, a report by AFS Sand Division Committee 8-Y, presented by A. E. Murton, Dept. of Mines & Technical Surveys, Ottawa, Ont., Canada. The committee sent a questionnaire to 74 representative Canadian foundries to determine the type of program they preferred to have the committee carry out. Twenty replies were received.

Results of the survey indicate that Canadian foundries have been changing gradually from natural to synthetic sand systems, mostly because they feel that the change will give them better control of sand properties. Some foundrymen add bentonite to natural sand and mull it to get more sand control.

Although foundrymen wish to find sources of Canadian sand, they are using less of such sand than they were a few years ago. There are no widely used sources of Canadian natural or sharp sands. When Canadian sands of suitable grade can be produced economically, Canadian foundrymen will use them.

Apparent Thermal Conductivity of Molding Sand at Elevated Temperatures, by D. H. Whitmore, Northwestern University, Evanston, Ill., and Q. F. Ingerson, Ampco Metals Inc., Milwaukee.

The prominent role played by thermal properties of molding sands in influencing the manner and rate of solidification of castings, as well as the extent of certain types of casting defects, is well known. Direct experimental observations of the apparent thermal conductivity of molding sands were made over

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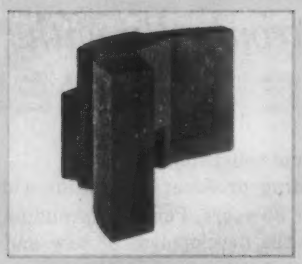

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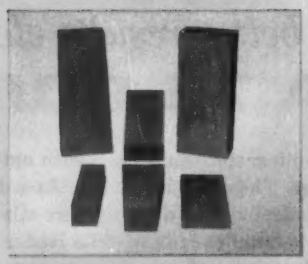

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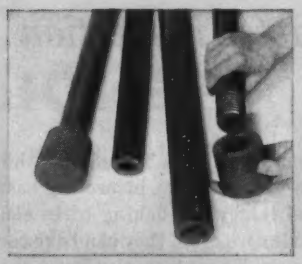

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the temperature range 900 to 1800° F with a steady-state method which utilizes a cylindrical test specimen and a centrally located silicon-carbide heater.

The experimental curve of the apparent thermal conductivity of a synthetic silica molding sand versus temperature exhibited certain pronounced characteristics: 1. A decreasing conductivity with increasing temperature below 1100° F. 2. A shallow minimum between 1100 and 1500° F. 3. A sharply rising conductivity with increasing temperature above 1500° F.

Temperature behavior of the apparent conductivity was interpreted in the light of a proposed model which considers heat transfer through the molding sand containing small isometric pores to occur by radiative-heat transfer across pores and solid grains as well as by pure thermal conduction through the solid phase itself. At temperatures below 1100° F lattice conduction predominates, whereas at temperatures in excess of 1500° F radiative-heat transfer across both pores and sand grains contributes significantly to the total heat flow.

Calculations of the apparent thermal conductivity based on this model agree favorably with experiment, provided account was taken of the fact that radiative-heat transfer across the grain diminishes more rapidly with temperature than a cube law permits.

Molding Sand Control by Green Compressive and Shear Strengths Testing, by R. W. Heine, University of Wisconsin, Madison, Wis.; E. H. King, president; and J. S. Schumacher, vice president, Hill & Griffith Co., Cincinnati. Control of foundry molding sand has progressed rapidly from the standpoint of the technology of the individual tests, as well as the acceptance by the foundryman of the need for control.

A great deal is known about the relationship of the physical values of new sand mixtures comprising clay, sand, and water, with or without additives. When molding sand is reused in daily foundry practice, rebonded and remulled many times, it results in a sand which contains some badly burned and completely dehydrated clay, various levels of new clay content. This raises the question as to the bonding efficiency of the AFS or true clay content in a given molding sand.

The authors present a method for determining the bonding power of clay in foundry sands quickly and accurately. This methods uses "effective clay content," defined as the bonding power of the clay in a used foundry sand expressed as a percentage equivalent to bonding power of a given new clay amount.

Based on actual field testing over a wide number of foundries, it now appears that the method of determining the effective clay should go a long way in removing the mystery and variables in practical shop sand control. If, in addition, the information now known about the moisture requirements of molding sand is applied using a satisfactory and consistent fineness and distribution of base sands, the bonding power of the clay can be controlled within the desired limits. This should lead to the production of better quality castings at lower cost.

Sampling of Sand — Report of the Grading, Fineness and Distribution Committee, Sand Division, presented by S. A. Wick, technical engineer, New Jersey Silica Sand Co., Millville, N. J., and vice chairman of the committee. The report states that sampling assumes more importance as foundry mechanization increases. There is no standard method for sampling, and sieve test results vary among individual samplers.

The only way to judge a shipment of sand is by sampling, and the samples must be taken in such a way as to be representative. One of the big problems in sand sampling is the lack of duplicating of results. The report recommends procedures that should tend to standardize sampling.

"I don't care whether it's massaging your back or not. I said 'Get off!' "

Effect of Ramming and Clay Content on Hot Compressive Strength of Molding Sand, by R. W. Heine and W. Shaw, University of Wisconsin, and J. S. Schumacher and E. H. King, Hill & Griffith Co., Cincinnati. Presented by Prof. Heine.

In tests made with molding sand mixtures containing differing amounts of clay or bentonite, it was found that as the mold hardness was increased from 60 to 90 by harder ramming, the hot strength increased tremendously. With the same mold hardness and increasing amounts of bond, the hot compression strength followed a straight line to about 1000° F, followed by a rapid rise to 1500°, and then a steep rise to 2000° F.

With constant ramming, the hot strength rose with increasing amounts of bentonite until an excess of bentonite was present; then the hot strength decreased. With fireclay, the hot strength rose constantly as the amount was increased. Additives in connection with the bonding material caused a leveling off and a decrease in the rate of rise of hot compressive strength.

Phenolic Resin Bond in Solid Sand Cores, by H. K. Salzberg and J. J. Greaves, Borden Chemical Co., Bainbridge, N. Y. Presented by Mr. Salzberg. Discussed bonding by resin including such factors as sand grain size, packing, capillarity, and adhesion properties.

Density-Sand Grain Distribution Effect on Physical Properties, by T. W. Seaton, American Silica Sand Co. Inc., Ottawa, Ill. Report of the AFS Sand Division Basic Concepts Committee, following a study of available data, concludes that when sands of similar AFS grain fineness numbers are compared, the sand with the broadest distribution will develop the highest physical properties when the sands are mulled, clay bonded, and tempered to the same conditions.

When sands with the same

"peak" sieves are compared, the sand with the lowest peak (broadest distribution) will develop the highest physical properties when they are mulled, clay bonded, and tempered to the same conditions.

Use of the Shatter Test for Controlling Clay-Bonded Sand by W. B. Parkes and R. G. Godding, British Cast Iron Research Association, Birmingham, England. This paper, officially sponsored by the association, was presented by Mr. Godding, and described a method employed in Britain for sand control.

The process consists of dropping a weighed sand specimen from a height of 6 ft onto a ½-in. mesh sieve or screen. Amount of sand remaining on the screen is termed the shatter index. The test is used as an indication of flowability of the sand; the higher the index, the lower the flowability. It does not replace any of the other tests employed for sand, but gives additional information on properties.

A Systematic Approach to Foundry Sand Design and Control by A. H. Zrimsek and G. J. Vingas, Magnet Cove Barium Corp., Arlington Heights, Ill. Presented by Mr. Zrimsek. The speaker's firm has started on a long-range program to study carefully all the characteristics of sands which might be correlated into a means for developing suitable molding sands for various applications, and also for controlling their properties more closely during use.

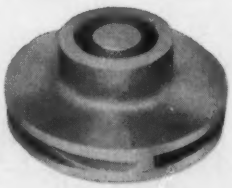
Selected Principles of Soil Mechanics Related to Sand Testing, Molds and Cores, by Douglas C. Williams, Ohio State University, Columbus, Ohio. An attempt was made to relate certain principles of soil mechanics to evaluating sand test data. According to these principles, if the compression and tensile strengths are known, there can be only one value for the shear strength. This paper suggested a new approach to studying the subject of sand flowability.

A search of foundry literature for material relating the principles of soil mechanics to the evaluation of foundry sand test data and molding practices has so far proved fruitless. The paper proposed to introduce some concepts from the discipline of soil mechanics, and at-

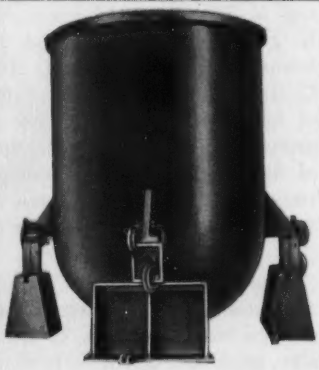
(1) Jet Engine Shroud and Flange Rings—Type CK-20 & CF-8C casting alloy. Centrifugally cast.

(2) Casing for single-stage, double-suction pump. Type CE-30.

(3) Ductile iron crankshaft.



(4) 70-30 copper-nickel centrifugal pump impeller.



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tempt to illustrate their usefulness to the foundryman.

Effect of Variation of Some Physical and Chemical Conditions on Properties of Bentonite Suspensions, by A. J. Anderson and G. J. Sutton, University of New South Wales, Sidney, Australia. Presented by title in absence of authors.

Casting Loss Reduction Program, by H. W. Dietert, chairman, Harry W. Dietert Co., Detroit. The reduction of casting losses is a paramount issue in the casting industry. The production of high-quality castings demands close inspection which means high rejection should quality control in the foundry ever lose its efficiency.

The efficiency of quality control can best be held at a good working peak when casting losses are correctly classified and their elimination procedure is well understood. A definite plan of action is essential. A purpose of the report was to set forth a programming plan for casting loss reduction. It did not cover the entire field, being concerned with losses obtained from inefficient working of molding sand which could be used as an example to attack the other losses experienced.

First step is to determine the source of the loss. Six principal sources of casting loss are design, metal, pattern equipment, molding equipment, core and molding sand. All casting losses may be ascribed to one of these six.

The second step is to determine whether the loss can be classified as man-made or caused by the source not being capable of performing its task. Man-made losses are much more numerous than source-made losses. Third step is to reason the cause. In the man-made classification, the cause may be failure to follow instructions or incorrect instruction. In the case of source-made classification—for example, molding sand-made losses —the cause of expansion losses such as a scab is the rate of expansion of sand greater than the rate of hot deformation.

The fourth step is correction. Have a clear and precise correction formulated and then execute it so as to remove the cause of certain changes. Step five is to make a definite change. Whether the loss

is man-made or source-made, change must be made.

At the annual Sand Division dinner, a paper on **Foundry Production in the USSR** by Prof. Ylian A. Nekhendzi, Leningrad Polytechnic Institute, Leningrad, Russia, was presented in the author's absence by Prof. Douglas C. Williams, Ohio State University, Columbus, O.

Major portion of the paper was devoted to a brief description of Soviet research and investigations dealing with ferrous and nonferrous castings and their production.

The author pointed out that in 1959 more than 10 million tons of iron castings and 3 million tons of steel castings were produced, and the target for 1965 is 16 million tons of iron and 4 million tons of steel castings. Output of nodular iron castings has reached 250,000 tons annually, and is steadily increasing. Present trend is toward large foundries and elimination of the small foundries. Minimum capacity will be from 50,000 to 100,000 tons, and the foundries will be highly automated.

According to Prof. Nekhendzi, about 1750 foundry metallurgical-engineering students were graduated in 1959.

EDUCATION

● THE SINGLE session sponsored by the Education Division dealt with methods of fabricating industrial parts and the factors which must be taken into consideration when a particular method is chosen.

An Evaluation of Various Methods of Fabrication, by J. G. Frantzreb, Caterpillar Tractor Co., Peoria, Ill. Research and development comprise a basic, essential activity of industry. One aspect of this activity is the search for a better way of doing any given job. At Caterpillar, this search goes on constantly.

Each part must be studied individually in terms of the quantity to be produced, strength requirements, appearance desired, and similar factors vital to the selection of the fabrication method. The goal of this study is to produce a satisfactory part economically, and it requires the most economical use possible of materials and equipment.

This type of research and development is important to the foundry industry because it has not grown at the same rate as industry as a whole. The importance of this lag thus is that the foundry industry is for all real purposes losing business that it could have.

Castings should be made, handled, and sold as quality products. Delivery dates should be met, and bad castings should not be delivered to the customer. Modern production methods do not permit disruption of schedules to inspect incoming components. The foundry industry has the basic tools to do a good job, but doesn't make the most effective use of them. Other forms of fabrication generally have the same problem.

PATTERNMAKING

● THREE technical sessions and a roundtable luncheon comprised the Pattern Division program, which included discussions of unusual patternmaking techniques. Among these were a process for the carbonyl deposition of nickel and the electroforming of metal patterns.

Carbonyl Deposition of Nickel for Patternmaking, by J. O. Trimble, Carbonyl Metal Products Div., Budd Co., Philadelphia. In this process, a master pattern is treated with a release agent and sprayed with eutectic tin to form a female mold. This negative is placed, with the inner surface up, in a sealed chamber, and heated to 325-340° F. Nickel carbonyl gas then is introduced, and heat decomposes the gas to CO and nickel. The latter is deposited on the heated surface of the molds in thicknesses up to as much as ½ in. The nickel positive later is removed and can be backed with epoxy resin mixed with metal fiber and a backing plate if desired. For more details, see FOUNDRY, p. 254, May, 1960.

Electroforming for Pattern Construction and Repair, by P. J. Ritzenthaler, Plating Engineering Corp., Milwaukee. In essence, electroforming is a version of electroplating in which the metal deposit is built up to make a shell which is an object in itself, not a coating. Thickness can be up to ½ in. or more. The chief plating metals are copper, nickel, and iron. Which is used depends on the use to which the pattern will be put. The metal shell formed can be backed with epoxy, babbitt, type metal, or similar substances.

This process also can be used to build up undersized patterns, repair pattern damage, or make engineering changes. To provide longer pattern life at lower cost, aluminum patterns can be made undersize and built up to tolerance by nickel plating. Electroforming makes an exact reproduction, without warpage, in sizes up to as much as 3 x 4 ft. There is some difficulty with deep, narrow cavities or slots. These require special handling.

New Materials for Wood Patternmaking, by R. LeMaster, Nelson Pattern Co., Milwaukee. A new carvable epoxy plastic offers various advantages as a pattern material. It resembles mahogany in appearance, weight, and hardness, and can be carved with hand tools and conventional woodworking equipment. It is obtainable in the form of planks up to 6 ft long and up to 2½ in. in thickness, and also in paste form. It costs approximately $3.50 to $4 per board foot or about $3.00 a pound in the paste form.

Advantages of the material include absence of grain, which facilitates working, and resistance to warpage and swelling. It is more flame resistant than wood and will not dent or nick as easily as mahogany. When properly coated, the material is said to last as long as mahogany.

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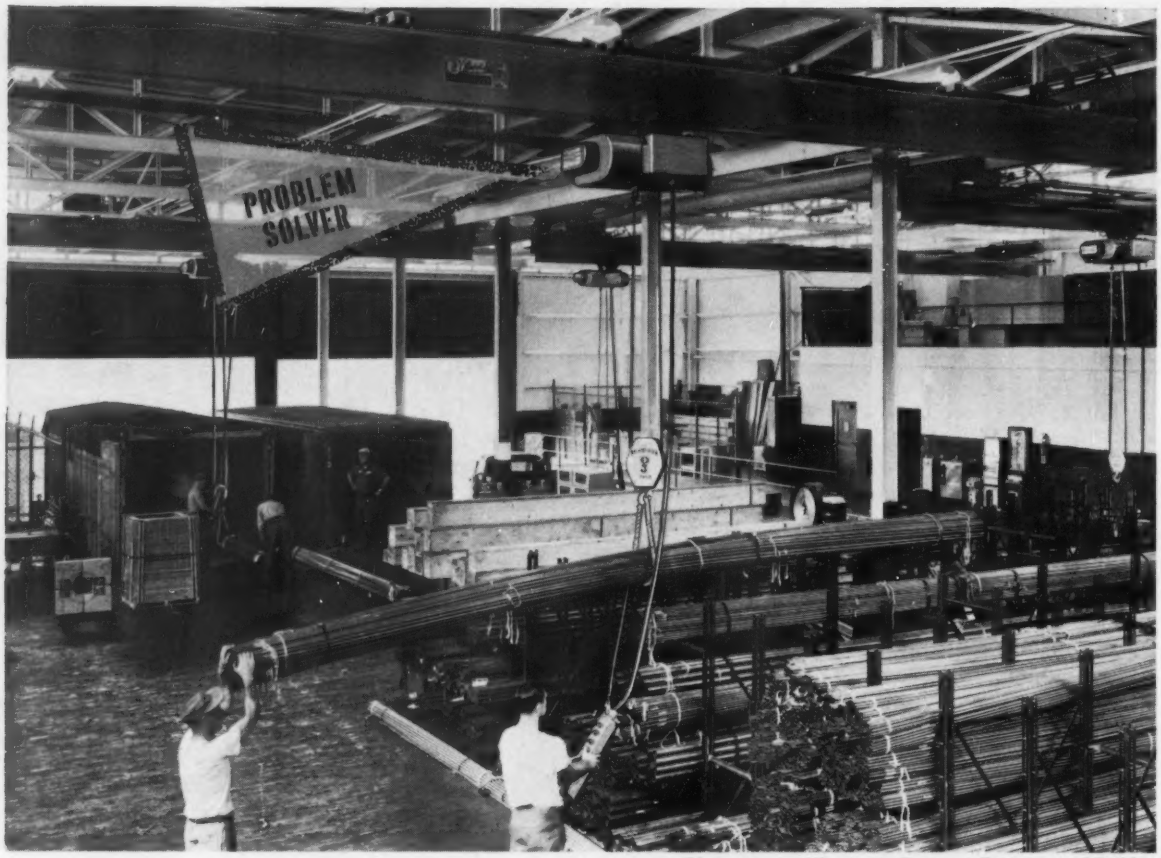

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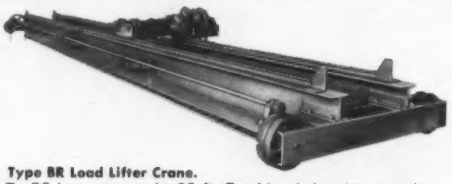

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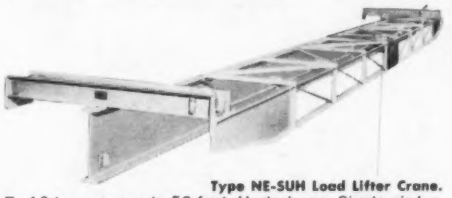

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ing, by Irwin Lubalin, Shaw Process Development Corp., and R. J. Christensen, Wisconsin Pattern Works Inc., Racine, Wis. Techniques in the production of ceramic molds by the Shaw process, which now is used by about 100 licensees throughout the world, were explained. The mold material results in what is termed microcrazing on the mold face which provides resistance to shock of the molten metal. Castings have close dimensional tolerances and can be made in larger sizes than those produced by the usual investment molding process. Among the major applications of the process are the production of dies for both glass and rubber producing molds, and diecasting dies.

Mr. Christensen explained that the growing use of permanent molds and shell coreboxes has stimulated the need for more accurate parts having smooth surfaces in addition to a dense metal structure. This need has increased the use of the Shaw process for castings of these parts. He described the foundry facilities of his pattern works for the production of metal patterns by the Shaw process. Dimensional tolerances attained on pattern castings are ±0.005 on lengths up to 3 in. and 0.030 on lengths of 8 to 15 in.

Marketing Your Product — The need for improved marketing of patterns was stressed by S. C. Massari, technical director, American Foundrymen's Society, at the round-table luncheon of the Pattern Division. He pointed out that because better quality in castings is needed, improved patterns also are required in view of the relation between the two products.

Both foundries and patternmakers must be alert to use of new products and new developments in those materials and processes which can improve the quality of the final casting. Unless both the cost and the quality of patterns are favorable, the user may be induced to turn to other processes of manufacture. Mr. Massari pointed out that patternmakers ordinarily are poor salesmen, and he outlined the type of marketing program needed to improve this condition. Such a program includes market analysis, sales planning, and selling processes.

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for Blowing Foundry Sands, Venting, and Design, by Z. Madacey, Beardsley & Piper Div., Pettibone Mulliken Corp., Chicago. Production of satisfactory cores on blow machines depends on proper rigging of the boxes, accurate sand control, and utilization of the correct vent and blowhole areas.

Important factors in rigging are proper sealing at the box point and proper venting. Moisture content of the sand mix is important. If more water is present than that required to saturate the binders and other additives, the air carries that free water to the corebox surface and causes the sand to stick. Dry sand will not hold specified core requirements.

No universally applicable standards for determining correct vent and blowhole areas have been developed. Generally, less venting is required for readily flowable sands because less air is required for blowing.

More air is required to carry high green strength sands, and vent area must be larger. The faster air escapes from a box, the greater the impact of the sand in the box and the greater the density of the core.

During discussion it was pointed out that in blowing, air acts as a vehicle to carry sand into the box. In core shooting, air acts as a ram to push sand into the box. Blowplate holes are smaller for blowing and larger for shooting.

Plastic Patterns—New Tools and Equipment, by Frank Kobee, Ohio Metal Fibers Inc., Toledo, Ohio. The operation and use of an epoxy resin spray gun with throwaway cardboard container for making glass cloth laminated patterns were described. A gun to spray 1/16 to 1/4-in.-long metal fibers also was described. These fibers help bond plastic to plaster in the making of plastic-faced plaster master molds for use in producing laminated plastic patterns.

FUNDAMENTAL PAPERS

● IN TWO SESSIONS devoted to fundamental subjects, consideration was given to a wide range of topics pertaining to nonferrous and ferrous materials. They included solidification, grain refinement, hot tearing, dephosphorization and desulphurization, structure and microporosity effects, and vacuum melting.

Solidification of Aluminum Casting Alloys, by R. E. Spears and G. R. Gardner, Aluminum Co. of America, Cleveland. Presented by Mr. Spears. Through application of metallographic and microradiographic techniques at various stages, the mode of solidification of several aluminum alloys was investigated. Conclusions were that the matrix of the alloys is formed by growth of primary dendrites and by deposition of solid solution material around them. Dendrites are refined considerably by increasing solidification rate. Effect of alloy variation on dendrite cell size is slight.

Dendrite form depends on alloy content and solidification rate. Where large amounts of solid solution are available immediately below the liquidus, compact dendrites formed. For those containing considerable constituent material dendrites form mostly along the primary stems. Amount of secondary and tertiary growth increases with increasing solidification rates for all alloys. Grain size was established immediately below the liquidus. Alloy composition tends to reduce grain size for solid solution type as alloys compared with those with appreciable solidification near the solidus. Constituents which solidify near the liquidus tend to be larger than those which solidify near the solidus.

Precision-Casting Mold Materials, by W. G. Lawrence, Alfred University, Alfred, N. Y. Desirable attributes of the materials are high-temperature stability, pourable mixes that harden or set in a controllable time, simplicity of compounding, dimensionable stability, and low cost. Others include decomposition temperature above 3000° F, a thermal expansion curve with no abrupt change, and a suitable particle distribution which promotes good packing.

Mold materials that were used prevent hot tears in the castings due to the slowing down of the solidification rate, as indicated by results obtained in pouring a spherical casting in dry sand and in ethyl silicate bonded refractory. In dry sand the solidification time was 6 seconds, in ethyl silicate material at room temperature 60 seconds, at 1000° F 100 seconds, and at 1800° F 200 seconds.

Grain Refinement of Copper, by G. C. Gould, G. W. Form and J. F. Wallace, Case Institute of Technology, Cleveland. Presented by Mr. Gould. As-cast grain size of electrolytic copper was refined appreciably to about 0.250 mm average by addition of approximately 0.50 per cent by weight of lithium and bismuth singly and in combination; a much larger amount of bismuth than lithium was retained.

Grain refinement was attributed to constitutional supercooling. Considerable grain refinement by solution of large amounts of iron (2.4 per cent) in the melt before solidification was obtained, the average grain size being reduced to about 0.10 mm, and the effect is attributed to the peritectic reaction. Iron in smaller amounts then necessary for that reaction did not produce refinement of the grain.

Hot Tearing in Nonferrous Binary Alloys, by R. A. Rosenberg, Walworth Co., Braintree, Mass., and M. C. Flemings and H. F. Taylor, Massachusetts Institute of Technology, Cambridge, Mass. Presented by Mr. Rosenberg. Using test specimens of varying length subjected to restrained contraction, the resistance to hot tearing of a number of binary alloys was determined by the length of a solid specimen. Alloys included aluminum-magnesium, aluminum-copper, aluminum-tin, magnesium-aluminum and magnesium-zinc.

For aluminum-magnesium the minimum resistance to tearing was 9 in. at 4 to 6 per cent Mg; with aluminum-copper it was 3½ in. at 5 per cent Cu, and for aluminum-tin the specimen length was less than 3 in. at 0.25 to 5 per cent Sn. Minimum tearing resistance for magnesium-aluminum alloys was 7 in. at 4 per cent Al, and for magnesium-zinc it was 5½ in. at 5 per cent zinc.

after 16 heats A. P. GREEN SATANITE joints protrude beyond the firebrick sidewalls

A large midwestern foundry reports excellent results from furnaces in which A. P. Green SATANITE slag resisting mortar was used in laying up the sidewalls. The photographs clearly tell the story. A sidewall is shown immediately following installation and after 16 heats.

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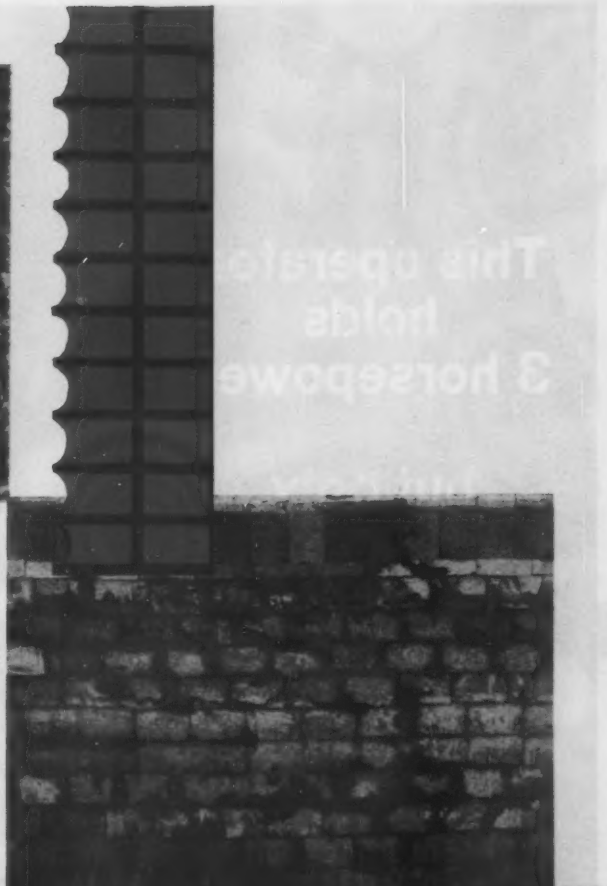
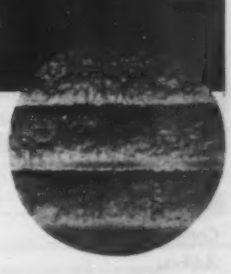


EMPIRE FIREBRICK SIDEWALL OF MALLEABLE AIR FURNACE LAID UP WITH A. P. GREEN SATANITE. NOTE THE THIN BRICK-TO-BRICK JOINTS.

SAME SIDEWALL AFTER 16 HEATS



CLOSE-UP SHOWING SATANITE JOINTS PROTRUDING ⅛ to ¼" BEYOND SURFACE OF FIREBRICK.

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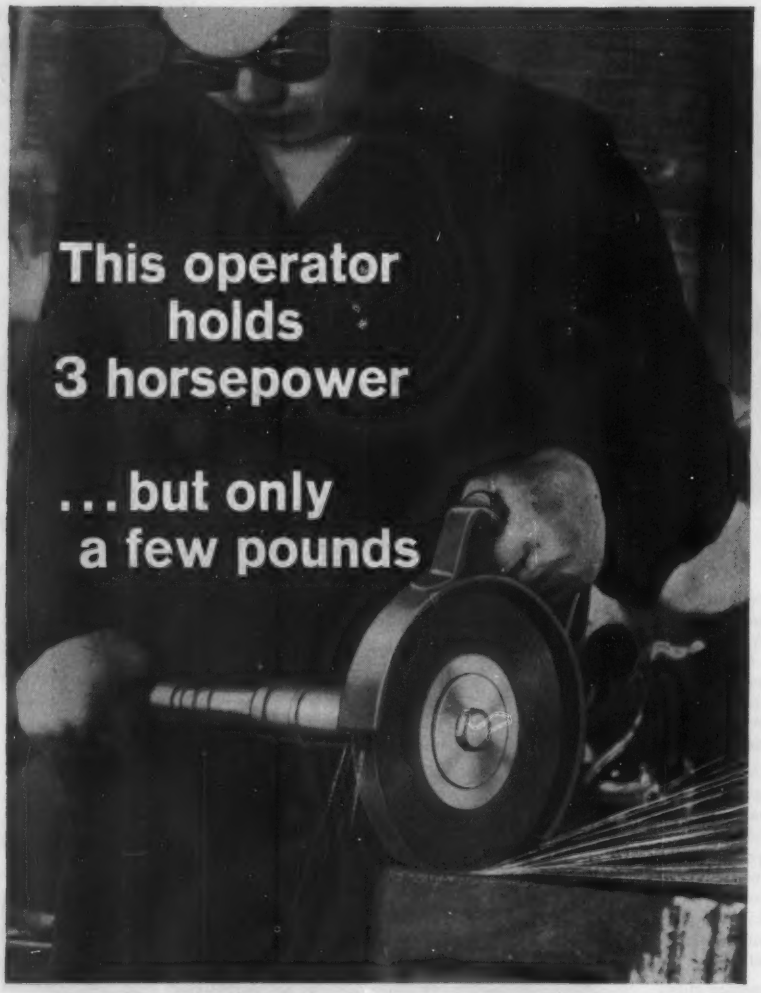

Remington flexible shaft machines give an operator the flexibility of a hand tool plus the power for heavy-duty finishing operations in a convenient unit that weighs just a few pounds. Remington machines are ¾, 1½, or 3 hp and they're available in dust- and vaporproof or ventilated, industrial-duty motors.

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Some Considerations in the Kinetics of Dephosphorization and Desulphurization of Basic Electric Steels, by John Zotos and E. DeLucca, Watertown Arsenal, Watertown, N. Y. Presented by Mr. Zotos. This study was made during production of steel in a 6½-ton basic electric furnace. Dephosphorization proceeds in accordance with the transfer reaction, P in the metal to P in the slag. Logarithmic rate of the reaction, d log P in the metal divided by dt, is constant during the oxidizing period but increases in magnitude from heat to heat with the average dephosphorizing power, P in the slag divided by P in the metal.

Desulfurization proceeds in accordance with the transfer reaction, S in the metal to S in the slag. Logarithmic rate of desulfurization, d log S in the metal divided by dt, is constant during the reducing period of the heat but increases in magnitude from heat to heat when (a) the average reaction power, S in the slag divided by S in the metal, increases in value, or (b) the average slag parameter equal to the slag's basicity divided by its oxidizing power increases in magnitude.

Desulphurization by Calcium Injection Improves Properties of Cast Steel, by D. A. Colling and P. J. Ahearn, Watertown Arsenal. Presented by Mr. Colling. Rapid desulfurization to a residual sulfur of 0.002 per cent was obtained by aluminum deoxidation, use of a basic slag cover, and calcium inoculation of 2 per cent by weight of CaMnSi.

Reduction of sulfur to that level resulted in 50 per cent improvement in reduction of area and 45 per cent increase in impact strength at minus 40° F. Ductile cup and cone fractures were exhibited by broken tensile test bars. Desulfurization time for reduction of S from 0.025 to 0.002 per cent was about 10 minutes for the described technique.

Effect of Structure and Microporosity on Mechanical Properties of High-Strength Cast Steel, by S. Z. Uram, M. C. Flemings and H. F. Taylor, Massachusetts Institute of Technology. Presented by Mr. Uram. Using solid cylinders, plates, and step wedges produced under carefully controlled conditions, the interrelation of grain structure, microporosity, and ductility in high-strength, low-alloy steel castings was determined.

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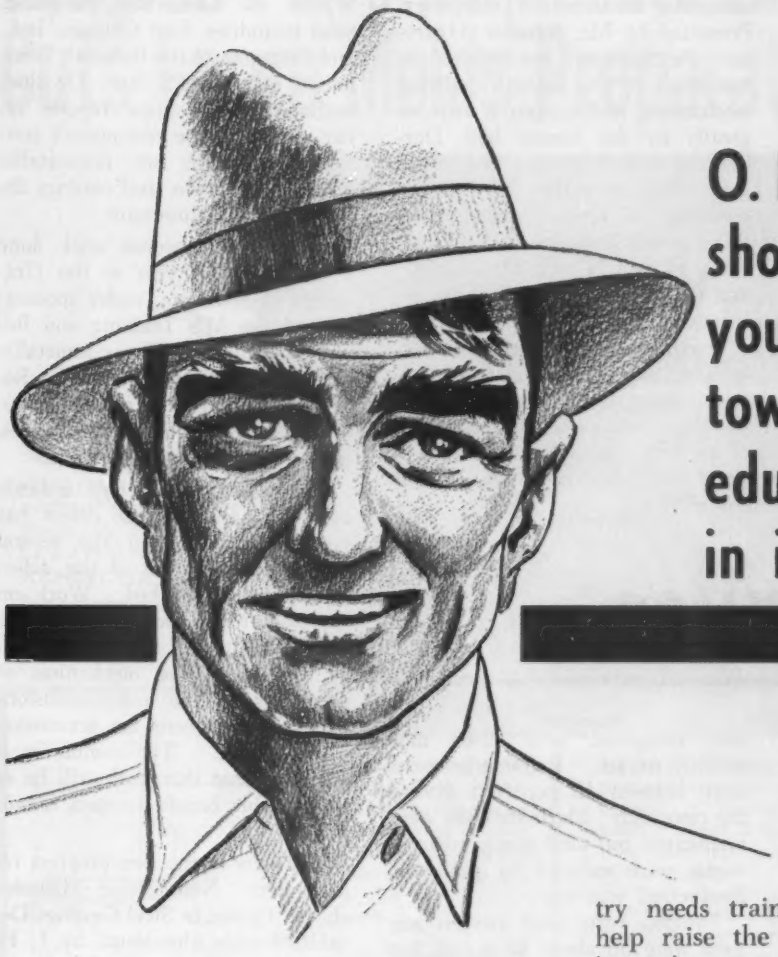

O. K. Mac; so why should I help young men toward a foundry education? What's in it for me?

All right, sir we'll give it to you straight: You may never see the young men you help today. But, you are part of the foundry business, and we assume that anything that helps the foundry business helps you.

Shop experience and good old practical know-how may have been good enough for yesterday's foundry, but things have changed. The cast metals industry needs trained engineers to help raise the quality of castings, improve production efficiency and broaden sales.

As you may have noticed, foundry engineering talent is scarce. With your help, we want to correct this situation. We want to encourage bright young men to study all phases of foundry engineering. They will form a pool of potential foundry experts. When you need trained engineering brains, you simply dip into the pool that you helped to create.

Write for our booklet "Let's Look Ahead."

Foundry Educational Foundation

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Results showed that microporosity has a drastic influence on properties, and it can be nearly eliminated by maintaining steep thermal gradients during solidification. With extremely sound metal, reduction of area values up to 40 per cent can be obtained at a strength level of 250,000-300,000 psi in high-purity 4340 steel. Columnar zones of test castings produced were found to be most ductile and have less likelihood of microporosity since the conditions favoring such grain formation are conducive to good feeding.

Vacuum Induction Melting of High-Strength Steels, by P. S. Schaffer and P. J. Ahearn, Watertown Arsenal, and M. C. Flemings, Massachusetts Institute of Technology. Presented by Mr. Schaffer. Hydrogen and nitrogen are reduced to low levels by the inductive stirring mechanism, and oxygen is reduced greatly by the carbon boil. During the boil, hydrogen and nitrogen diffuse into the CO bubbles, resulting in further reduction of those gases. Residual gas contents of O, H, and N of 0.0003, 0.00001 and 0.0005 per cent by weight, respectively, and lower are attained.

Ductility and toughness of vacuum-melted high-strength steels are substantially improved over those that are air melted, the result of reduction in nonmetallic inclusions and lowering of residual gas content.

STEEL CASTINGS

● FIVE technical sessions and a roundtable luncheon featured the activities of the AFS Steel Division. Among topics discussed in the 13 papers were use of oxygen in electric furnace meltdown, centrifugally cast steel tubing, surface defects in shell molded castings, austenitic manganese steels, and castings for replacement of forgings and fabrications at high strength levels.

The roundtable luncheon was devoted to a comprehensive progress report on the division's research project on nonmetallic macroinclusions in steel castings deoxidized with aluminum.

Oxygen-Gas Burner Use for Scrap Meltdown in the Small Arc Furnace, by V. J. Howard, Oklahoma Steel Castings Co., Tulsa, Okla. Meltdown time has been reduced during the past year through use of an oxygen-gas torch. Heats approximate 7800 lb. The torch consists of a 1-in. oxygen pipe inside of a 1½-in. gas pipe. Inserted through a horizontal slot in the furnace door, the torch is capable of delivering 6000 cu ft of oxygen and 4000 cu ft of gas per hour. The torch is manipulated to cause the flame to cut under the electrodes.

To determine comparative effectiveness of the torch, oxygen was used on alternate heats. With oxygen, heats were obtained in 52-53 min, compared with 62-63 min without oxygen. Refractories costs were lowered 15 per cent during the campaign. Electrode costs were unchanged but total power requirements were reduced 15 per cent. Production was up.

Tangible costs when oxygen was used were up about $1 a ton, but intangibles were down an undetermined amount. Experience indicated that use of the oxygen-gas torch is economical only when there is a need for it—for example, molds waiting to be poured.

Alloy 20 Stainless Steel Production and Mechanical Properties, by L. Fink, Electric Steel Foundry Co., Portland, Oreg. This alloy, which contains both copper and molybdenum, has been made by the company for 23 years. Lead must be kept below 0.002 per cent. Alloy 20 is susceptible to hot shortness, consequently the research was conducted to ascertain how to overcome this disadvantage. One treatment employed was ladle addition of mischmetal and it tended to improve the metal. It was found also that hot shortness could be overcome by ladle additions of several other elements including titanium, vanadium, and boron. Carbon must be over 0.5 per cent to derive tensile strength of 60,000 lb psi and over.

John A. Rassenfoss, American Steel Foundries, East Chicago, Ind., and chairman of the Research Committee of the AFS Steel Division, outlined the progress reports on two phases of the committee's continuing research on nonmetallic macroinclusions in steel castings deoxidized with aluminum.

The reports covered work done during the past year at the University of Michigan, under sponsorship of the AFS Training and Research Institute. The nonmetallic macroinclusions, for which the Research Committee is seeking a solution, are called by various names, such as snotters, ceroxides, etc.

Research results to date indicate that the nature of the defect has been determined and the several modes for formation of the defect have been established. Work on the project will be continued this year. Additional information will be sought on the mechanism of formation of the macroinclusions and suitable means for prevention of the defect. The committee is confident that this work will be of considerable benefit to steel foundrymen.

Abstracts of the two progress reports are: **Nonmetallic Macroinclusion Causes in Steel Castings Deoxidized with Aluminum,** by L. H. Van Vlack, professor of ceramics and metallurgy; R. A. Flinn, professor of metallurgy, University of Michigan, Ann Arbor, Mich.; and G. A. Colligan, research metallurgist, United Aircraft Corp., East Hartford, Conn. Previous work indicated that the nonmetallic macroinclusions in aluminum-killed steels contained corundum (Al_2O_3) crystals accompanied by siliceous glass. Purpose of this report was to determine the sources of these inclusions by a combination of laboratory and field investigation. This work indicates that in addition to the formation of corundum during initial deoxidation, two other and more important sources exist.

First, aluminum dissolved in liquid steel reacts with ladle refractories, particularly certain fireclays, forming Al_2O_3 and a siliceous glass. This aggregate can then be washed into the mold. Secondly, although a clean metal stream enters the mold, drossy macroinclusions may be formed rapidly by a combination

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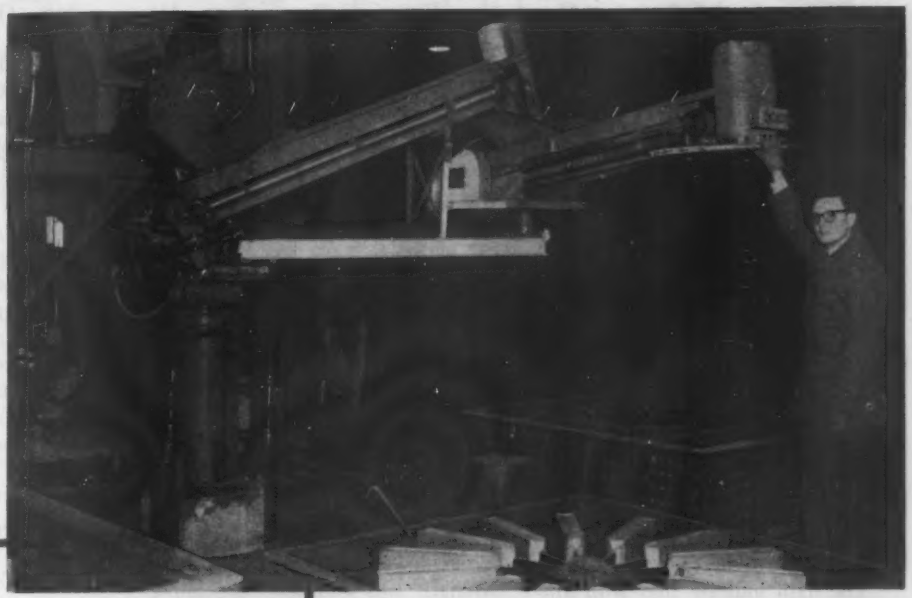
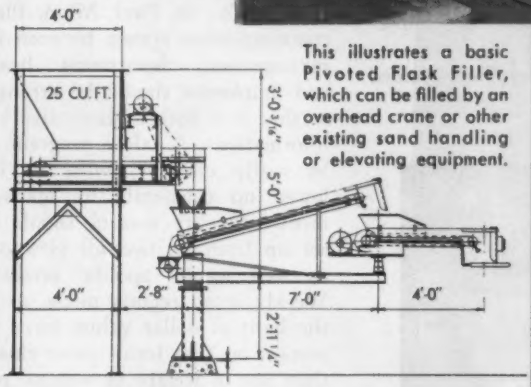
Cuts Large Molds Preparation Time 75%



Double Arm Flask Filler Unit installed in an existing Newaygo Sand Handling System at LEBANON STEEL FOUNDRY CO., Lebanon, Pennsylvania.



This illustrates a basic Pivoted Flask Filler, which can be filled by an overhead crane or other existing sand handling or elevating equipment.

LEBANON reports: "Molds over 60" x 60" are now prepared for the slinger under the flask filler. This consists of facing the pattern with new sand facing, adding about 2 inches of backing sand and ramming into place with air hammers. Gaggers are also added at this point.

"Two common sizes for this operation are 60" x 72" x 42", and 90" x 126" x 48". *We figure conservatively that preparation time on these two sizes and on others in the same range has been cut by 75%.*

"Previously, facing and backing sand was bled off the sand conveyor into wheel barrows or facing sand boxes, which were moved by main bay crane to convenient spots adjacent to the flasks. Sand was then shoveled by hand to prepare the pattern for slinging. Due to the relatively slow method of sand handling we were constantly faced with a congested work area adjacent to the shakeout and slinger.

"The much faster Newaygo Flask Filler Method has virtually eliminated this congestion, resulting in much better use of floor space.

"Having recently (in 1957) installed a Newaygo System, and having lived through the period of change in method, with the normal resistance to change, we were very pleased *two days after we had the Newaygo Flask Filler in operation to have comments from the men as to how much they liked the unit, both from increase in production and the lessened fatigue involved.* We have also found that in removing the facing sand boxes from the operation, we have been able to make better use of the main bay crane."

Complete information and specifications on all Newaygo Foundry Equipment are contained in BULLETIN NO. 56. Send for your free copy.

Mr. Mold Says:

The Newaygo Flask Filler permits using two kinds of sand through the filler by the use of two hoppers, one for facing, and one for backing, — filler capacity up to 50 cu. ft. per minute as needed.

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MOVIE "Progressive Mechanization", featuring HANDY SANDYS in 9 foundries . . . . . MOVIE "Newaygo Pallet Systems for Mold Handling", many types of installations in foundries . . . Our magazine "SAND SCRIPTS" . . . Bulletins: No. 60 on Pallet Line Systems of Mold Handling . . . No. 59 on HANDY SANDYS . . . No. 56 on Newaygo Sand and Mold Handling and Mold Making Equipment.

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of reactions involving surface air, subsurface aspirated air, and fine eroded sand grains. The degree of coagulation depends on the metal flow pattern.

Reactions Between Refractories and Molten Steel Containing Aluminum, by L. H. Van Vlack and R. A. Flinn. The three sources of nonmetallic macroinclusions in aluminum-killed steels are in order of formation: 1. Reaction between the aluminum added during tapping and the dissolved oxygen in the steel. $2\ Al+3\ O \rightarrow Al_2O_3$. 2. Interaction of aluminum dissolved in liquid steel and ladle refractories. $4\ Al+3\ SiO_2 \rightarrow 2\ Al_2O_3+3\ Si$. 3. Reaction in the mold such as aluminum with entrapped or surface air. $4\ Al+3\ O_2 \rightarrow 2\ Al_2O_3$.

The purpose of this report is to consider reaction 2, refractory-steel interactions. This is of importance because these can produce severe inclusions in the metal stream issuing from a teapot or even a bottom-pour ladle.

The data indicate that with alumina-silica refractories, reaction 2 is most active in the range of normal fireclay compositions and less important with high alumina or high silica refractories.

Properties and Applications of Centrifugally-Cast Steel Tubing, by E. D. McCauley, American Cast Iron Pipe Co., Birmingham, Ala. The cast steel tubes discussed are produced by a newly developed process. It consists of lining a steel mold with a wet ceramic material while the mold is being rotated. The ceramic material is a graded aggregate, and rotation of the mold results in the coarser material being carried toward the metal mold face while the finer material is concentrated at the face against which the molten steel is poured.

The mold provides a smooth casting surface without use of any coating. After the mold is lined, it is placed in a furnace and the coating is baked. Because of the rigidity of the lining, the mold can be rotated at speeds of 120 to 150 g without any problem of tears. The steel tubes are employed where high strength and soundness are important.

Surface Defects on Shell-Molded Castings, by R. W. Heine, University of Wisconsin, Madison, Wis., and J. A. Behring, Vollrath Co., Sheboygan, Wis., and presented by Mr. Behring. A number of defects and suggested remedies were discussed. One is orange peel resulting from lifting of the shell from the partially solidified metal. Remedies include prevention of warping, backing the shell with shot, and additions to the sand which alter shell expansion.

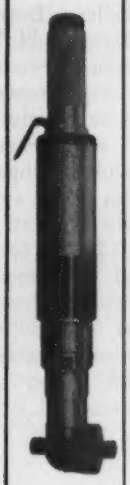
Another is surface shrinkage, which is corrected by insuring complete feeding or chilling through use of zircon sand. Corrective measures for metal penetration include proper use of parting materials to prevent sand sticking to the pattern, and control of resin sand mixtures and techniques. Surface pitting and roughness can be minimized by holding the resin content to 3 per cent or less.

Management by Objective, by R. W. Wilson, American Hoist & Derrick Co., St. Paul, Minn. Plant communication system between top management, department heads, and employees should be arranged so that it is both authoritative and informative. A safety program, to be really effective, must be followed up constantly by management. Quality control should be set up from an over-all viewpoint as well as by specific products. Weekly scrap reports made up on the basis of dollar values focus attention on that factor more closely than use of weight or volume percentage figures.

Heat Treatment of Mn-V-Mo Age-Hardenable Austenitic Steel, by N. C. Howells and E. A. Lange, Naval Research Laboratory, Washington. Presented by Mr. Howells. Age-hardening characteristics of these steels depend on the temperature of the solution treatment. Optimum conditions for developing full age-hardening potential of an alloy are one-half hour at 2100° F followed by a water quench.

Subsequent aging treatments required for maximum hardness levels are 1 hour at 1400° F, 6 hours at 1300° F, and 16 hours at 1200° F. An aging temperature of 1250° F is optimum for controlling the balance between yield strength and ductility. Yield strength of metal in the fully aged condition is direct-

Norman J. Dunbeck, left, incoming president of AFS, looks over part of his company's exhibit with Frank V. Jasienski, plant manager, Muncie (Ind.) Div., Albion Malleable Iron Co., Albion, Mich.



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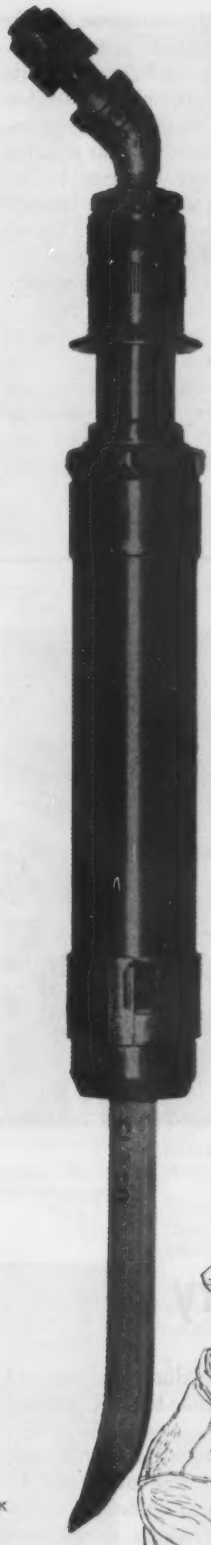

Cleco air tools are as quiet, as light weight, as economical, and as maintenance free as a tool can be and still do the job it was designed to with more efficiency than its rated capacity calls for. This is a true characteristic of Cleco Tools . . . their job performance usually exceeds your most critical demands.

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Circle 661 on Page 53

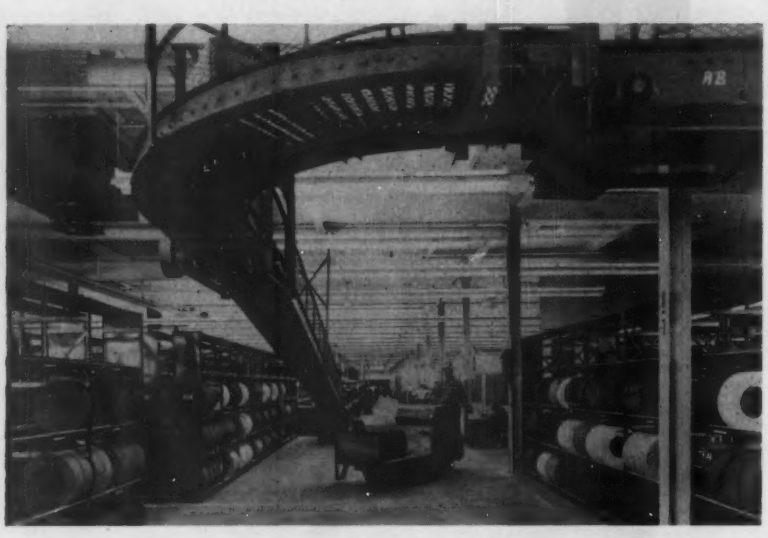
ly proportional to Brinell hardness. Yield strengths range from 80,000 to 150,000 psi for the composition investigated.

Effect of Homogenizing Treatments on Structure, Properties, and Transformations of a High-Strength, Low-Alloy Cast Steel, by A. M. Ayvazian, Watertown Arsenal, Watertown, Mass., and M. C. Flemings and Howard F. Taylor, Massachusetts Institute of Technology, Cambridge, Mass. Presented by Mr. Ayvazian.

This investigation was concerned with grade AISI 4340 high-strength cast steel. Increasing homogenizing temperature and time to a maximum of 16 hours at 2300° F resulted in nearly complete breakdown of the dendritic pattern. Results of tensile and impact tests conducted on material heat treated to the 250,000-300,000 psi range indicated the probability that a linear relationship exists between 1) reduction in area and a time-temperature parameter, T (C + log t) and 2) impact strength and the same parameter. In this equation T equals absolute temperature, t equals time in hours, and C equals material constant.

Time-temperature transformation curve drawn for the cast material agreed well with the published data for wrought metal of the same composition.

Impact Resistance of Nickel-Manganese Cast Steels, by I. B. Elman and R. D. Schelleng, International Nickel Co., Bayonne, N. J. Presented by Mr. Elman. Investigation showed that nickel is essential in raising low-temperature toughness. Nickel's effectiveness depends on the particular manganese content. Optimum tensile and low temperature impact properties were obtained with a 1.50 per cent nickel, 1.60 per cent manganese steel. Silicon-manganese-aluminum deoxidation was found to be superior to silicon-manganese deoxidation. Lower impact transition temperatures were obtained as suction size decreased.



General view of the stock area at Norton Co.'s new plant. The company has a total of 26 miles of shelves which hold 6 million grinding wheels for marketing

Open House Days Mark Norton's 75th Anniversary

● To celebrate its 75th anniversary, Norton Co., Worcester, Mass., held a series of open house days from May 4 to 20. Visitors included the business and general press, employees and their families, retired employees, distributors, foreign plant managers, and Rhode Island Chapter of the American Society of Tool Engineers.

A feature of the plant visit was a trip through a new $6½ million plant built to provide additional capacity for the production of resinoid, rubber and shellac-bonded grinding wheels.

New and improved manufacturing techniques were developed for this plant, such as automatic weighing equipment which draws from storage tanks the correct amounts of abrasive grain and bonding material. The system consists of three weighing carriages suspended from a monorail traveling in a loop under a row of raw material tanks.

To operate the system, a stack of punched cards is placed in a pedestal-mounted dispenser at the beginning of the cycle. As the carriage is brought into position, the dispenser issues one card to the machine, representing one batch of mix. The card then takes over control of the carriage, stops it at the proper tanks, engages a gear-operated gate, draws the correct weight of each material, and moves the carriage around the loop to the mixing area, where the hoppers are discharged automatically.

The Norton Co. began business in 1885 with the incorporation of the Norton Emery Wheel Co. There were seven founders, including Milton P. Higgins, first president, and John Jeppson, first superintendent. Descendents of both hold key positions with the company today. Milton P. Higgins, grandson of his namesake, now is president, George M. Jeppson, son of the first superintendent, is chairman, and his son, John Jeppson, is vice president and general manager of the Abrasive Division and director of manufacturing.

"Electrics do a better job on large heats,"

says Chester Petzke, centrifugal foundry superintendent, Ampco Metal, Inc.

Test bar is poured to check physical and chemical characteristics of the melt before emptying furnace into ladle.

Detroit Electric Furnaces range from the giant 8000 lb. Type CM shown above to 10-20 lb. Type ICID investment casting furnaces.

DETROIT ELECTRIC FURNACES have a 20-year service record at Ampco

"Ampco has long been a leading producer of bronze castings," says Mr. Petzke. "Most of our melting is done in Detroit rocker-type, electric-arc furnaces."

Detroit Electric Furnaces in service at Ampco range from 1200 pounds capacity to a giant 8000 pounder. Detroit Electrics have been turning out high quality alloys at Ampco for twenty years!

The indirect arc operation of these furnaces guards the melts from contamination, and their rocking action means homogeneity of the molten metal and optimum utilization of heat.

Other advantages of Detroit Electric Furnaces are faster melting, less metal shrinkage, longer lining life, uniform quality melt after melt, lower operating costs.

Detroit Electric Furnaces can meet your most exacting requirements—and save you money at the same time!

DETROIT ELECTRIC FURNACE

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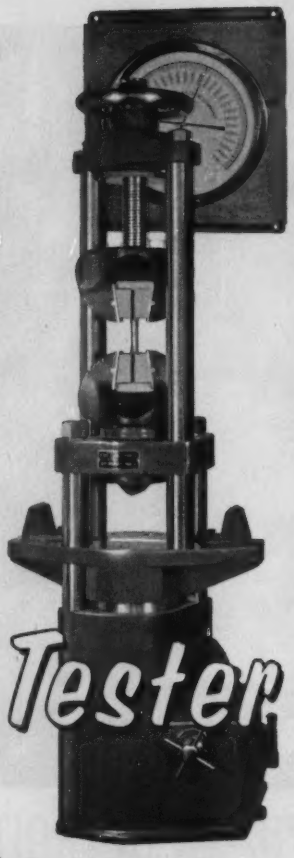
Ask for catalog sheets and prices, or send us your requirements for a quotation as this testing machine can be modified in many ways.

Investigate the 'DETROIT' line of hardness testers, ductility testers, and tensile testers. Special testing machine requirements are welcomed.



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DESIGNERS and MANUFACTURERS of COMPLETE CONVEYOR SYSTEMS

The Economics of Quality Acid Steel Making Practice, by C. F. Christopher, Blaw-Knox Co., East Chicago, Ind. Practice at this plant is to use the least amount of pig iron possible. Percentage of pig iron in the charge will vary from 15 per cent for 0.50 carbon metal to 35-38 per cent for 2.00 per cent carbon. Speed of melting and the longer furnace life compared with basic furnaces are important economic considerations in acid furnace use.

Cost of acid furnace operation is considerably higher than that for the basic unit on the lowest carbon steels, but this situation is reversed as carbon content exceeds 0.20 per cent.

Basic Oxygen Steelmaking—Some Speculations on Steel Foundry Applications, by S. E. Van Voris. Union Carbide Metals Co., Cleveland. More than 40 per cent of the additions to steelmaking capacity last year was accounted for by installation of basic oxygen furnaces.

Essentially a top-blown bessemer furnace, the oxygen unit overcomes the drawbacks of the bessemer in producing metal with low percentages of sulfur, hydrogen, nitrogen, and phosphorus. Both low and high carbon steels can be produced. A major feature of the furnace is its ability to remove approximately 90 per cent of the phosphorus from the melt.

Although this type unit has not been used to date for the production of steel for castings, it easily could be adapted. A basic cupola could be the source of hot metal, as is being done in the case of one steelmaker today. Comparative

"According to this statement, we're in business for our health"

costs of a hypothetical plant with a capacity of 100 tons a day indicates that a basic electric furnace installation would cost approximately $506 thousand. Cost of a combination cupola and basic oxygen furnace setup would be $569 thousand.

Stainless Steel Arc Melting Practice, by S. E. Wolosin, Lebanon Steel Foundry, Lebanon, Pa., described operating techniques in the production of stainless steel for castings.

Castings for Replacement of Forgings and Fabrications at High Strength Levels, by H. H. Harris, General Alloys Co., Boston. An evaluation was made of the casting process and competitive processes. Data were obtained from research of literature on U. S. and foreign casting processes for steel, high alloy, and light metal castings and from research, development, and pilot production projects for all branches, U. S. Armed Services.

The conclusion is that comprehensive integration of casting design, process, and metallurgy at the highest level of current knowledge and experience is a prerequisite to rational employment of steel castings at stress levels of 160,000 to 300,000 psi ultimate strength for beneficial replacement of forgings and fabrications.

Designers must be given more information about the advantages of castings and the importance of designing products to be made by the casting process specifically.

Some Metallurgical Factors Influencing Austenitic Manganese Steels, by T. E. Norman, D. V. Doane, and A. Solomon, Climax Molybdenum Co. of Michigan, Detroit. Presented by Mr. Norman. Good mechanical properties and improved resistance to gouging abrasion are produced when carbide dispersions are developed in the 12 per cent manganese, high-carbon types of austenitic steel. The carbide dispersions with grain refinement are obtained by combining a 2 per cent molybdenum addition with a special dispersion hardening heat treatment, involving pearlitizing at 1100° F followed by reaustenitizing within 1700 to 1900° F.

Also, a combination of improved wear resistance and moderate ductility is obtained with lean alloy types of austenitic steels. An example is one with composition of about 6 per cent manganese, 1 per cent molybdenum, and 1.3 per cent carbon. This steel is solution treated by water quenching from 1900-2000° F. It has good resistance to grinding and gouging types of abrasion.

HEAT TRANSFER

● THREE PAPERS were presented at the single heat transfer session. Subjects dealt with the production of castings in metal molds and a demonstration of the analogue computer.

Measurement versus Calculation of Solidification of Metal in Iron Molds, by J. D. Keller, Associated Engineers, Pittsburgh, and N. R. Arant, Roll Manufacturers Institute, Pittsburgh. Presented by Mr. Keller. A method was developed for calculating the time required for a given thickness of chilled iron shell to form by solidification. This knowledge is important in the making of double-poured iron rolls.

These rolls are made by first pouring chrome-nickel iron into an iron mold or chiller. After a solidified shell of the desired thickness is formed, the liquid metal remaining in the central part of the partially solidified roll is flushed out or diluted by an inflow of low alloy iron. The resulting roll has good hardness, compresive strength, and wear resistance in the outer part with greater toughness in the core and neck.

The calculation method is general and can be applied to a variety of casting problems.

Demonstration of the Analogue Computer, by V. Paschkis, Columbia University, New York. The computer demonstrated is based on the fact that the mathematics of heat transfer are the same for any

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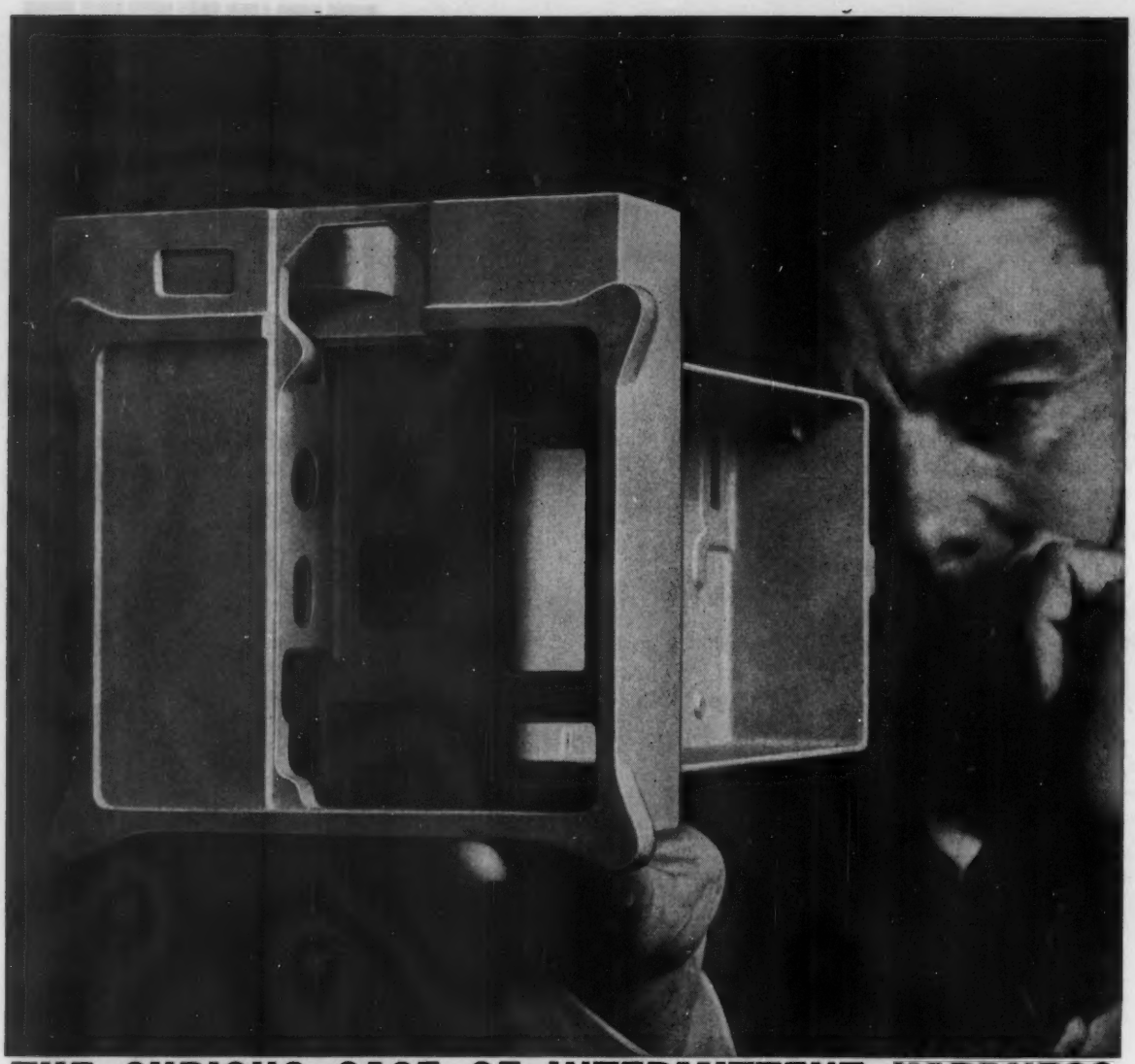

THE CURIOUS CASE OF INTERMITTENT HARDNESS

Another costly mystery—solved by the man from Kaiser Aluminum

THE PUZZLING FACTS. A manufacturer of aerial camera brackets recently found himself in a quandary. An intermittent hardness condition had developed on his castings made from aluminum alloy 2356-T6. This adversely affected the finish of the casting, shortened tool life, and increased machining time.

HOW THE CASE WAS SOLVED. What was the trouble? Upon personal investigation, the man from Kaiser Aluminum found it to be a combination of (1) inadequate furnace temperature control, (2) poor heat treating results due to varying delays before quenching and aging of castings. As soon as these procedures were corrected, production returned to normal.

WE LOVE A MYSTERY. This is one of many actual cases solved by Kaiser Aluminum working with a customer. Perhaps *you* have a mystery one of our technical engineers might help solve? He'll give you expert advice on any casting problem—including conversion from cast iron to aluminum, mold and die design, alloy selection, heat treatment, finishing, fluxing, metal transfer.

FULL ALLOY AVAILABILITIES. Kaiser Aluminum can supply you *fast* with a wide selection of casting alloys to suit any engineering requirement—from general purpose, low stressed alloys to alloys having good properties at elevated temperatures.

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heat transfer problem. The computer is useful for studying heat flow through a furnace, in studying metal solidification, and for other heat problems.

For study purposes, the computer can shorten or lengthen the times of given reactions.

Gap Formation in Permanent Mold Castings, by J. G. Henzel and J. Keverian, General Electric Co., Schenectady, N. Y. Results of a literature survey to determine knowledge about the mechanism of gap formation in permanent molds indicate the following conclusions:

At the instant of contact between molten metal and the mold, heat is transferred rapidly by conduction. Soon a gap is formed by gradual contraction of the frozen metal from the expanding mold wall. As the gap forms, heat is transferred by conduction and radiation. When full gap width is attained, heat is transferred by radiation only.

Time of formation and width of gap depend on many variables. Separation times of 3 seconds to 20 minutes after pouring are reported. Gap formation apparently starts where the highest rate of heat transfer at the casting-mold interface occurs.

Rate of heat transfer is at its maximum at the instant molten metal touches the mold and decreases continuously thereafter. Gap formation appears to reduce heat transfer rate by about half. The result of this reduction in heat transfer is that casting solidification time is increased.

SOLIDIFICATION

●THE SUBJECT of metal solidification came in for extensive discussion at a symposium sponsored by the Fundamental Papers and Heat Transfer Committees.

The topic was treated in six individual papers, the first of which was a discussion of general principles by G. W. Form and J. F. Wallace, Case Institute of Technology, Cleveland. This analysis was presented by Professor Wallace.

Solidification of various metals was discussed by four speakers. Types of metals and authors of the papers included: Steel—Charles W. Briggs, Steel Founders' Society of America; Cast Iron—Charles K. Donoho, American Cast Iron & Pipe Co., Birmingham; Aluminum —M. C. Flemings, S. Z. Uram, and Howard F. Taylor, Massachusetts Institute of Technology, Cambridge, Mass.; Copper Alloys— R. W. Ruddle, Foundry Services Inc., Cleveland.

In the case of each metal, the factors influencing solidification were described. Because of the extensive nature of the discussion, it is not possible to give a brief summary of the complete symposium. Study of individual papers is recommended, and the reader also is referred to the series of articles on the subject of solidification presented in the September, 1959, issue of FOUNDRY.

In summarizing the various papers, W. K. Bock, National Malleable & Steel Castings Co., Cleveland, pointed out that generally it is desirable to eliminate or at least minimize the columnar structure and have castings freeze with equiaxed grains. Usually, a small grain size is desirable. Nevertheless, it is not possible to give detailed solutions of the problem of how to obtain a fine equiaxed grain structure in a given casting, although principles are known and can be used in studying the problem.

The main factors leading toward desirable grain structure are 1) relatively fast cooling, 2) proper temperature gradient, and 3) artificial nucleation. From a foundry viewpoint, this means careful and perhaps ingenious selection of mold material, mold density, pouring temperature, selection and location of exothermic compounds, and use of foreign body nuclei.

Dr. Bock pointed out that the problem of solidification is complex and the factors involved are not always independent of each other. Although further advances may not be easy, the symposium papers should prove useful in consolidating present knowledge and practice.

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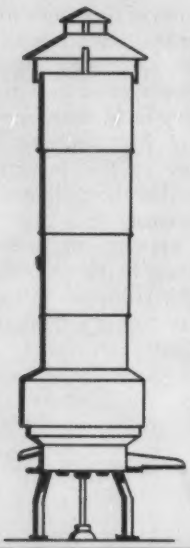
Trouble Shooting

By C. W. AMMEN



Small Cupola Practice

Dear Charlie:

One of the most confusing things we have to contend with is the operation of our small cupola. Although we are primarily a nonferrous shop, we operate a small stack, making just run-of-the-mill small gray iron jobbing castings. The combination of the ferrous and nonferrous work gives us a sufficient amount of work to make out, but either by itself in our town would not be enough.

We always seem to be in trouble because of coke height variations—unable to get proper amounts of coke charges to maintain the correct height. We have to resort to large coke charges every so often to bring our melting zone up to snuff.

Sincerely,
Sam

Dear Sam:

The operation of a small cupola is a lot trickier than that of a fairly large stack, but the basic operation and theory of cupola operations are simplicity itself. With continuous operation day after day, you finally reach a set of conditions and fixed shop practice that keeps you out of trouble for the most part. But when you melt just once in a while, it's tougher to repeat results.

You are not alone in your dual deal, however, for lots of nonferrous shops fill in with iron, and many small iron shops with a pit furnace or two make some brass from time to time.

Barring the hiring of a good, old-fashioned cupola man who melts by instinct and uses strong tobacco and cuss words, you must reduce your procedure to the simplest, most basic form possible and keep it that way.

The more things you vary and the more often you vary them, the more confusing things will become. Adopt a procedure and stick by it, right or wrong. Then you can eliminate your troubles by varying one thing at a time until everything settles down.

Now, to get back to the stack. The correct bed height is best established by time. Regardless of cupola size, this rule applies. The general procedure is to time the iron from the moment the blast is started. A steady, thin stream of iron should come out of the taphole not later than 10 minutes after blast begins or sooner than 8 minutes. If the metal starts too soon, you are melting too low; if it starts too late, your are melting too high in the stack.

The first iron charge should not contain any small pieces which could slip down, melt low, and produce false timing and oxidized iron. The trick is to keep the iron above the zone of free oxygen. Some operators judge the bed height by observing when the first drops of iron go by the tuyeres. This time should be approximately 6 minutes from the time the blast is started. Melting too high is costly, and melting too low produces oxidized iron.

A general rule to maintain the correct bed height is the 4-in. method. Weigh the amount of coke it takes to make a layer 4 in. thick in the cupola. This figure should give you the correct coke charge regardless of your melting ratio or diameter.

In the stack, this amount of coke will look like it's not nearly enough, but don't let it fool you. If your bed is at the correct height to start with, and if your blast is correct, 4-in. layers of good quality coke are ample to maintain the bed height and at the same time to give sufficient fuel to melt hot. Many a stack is run every day by simply poking in 4 in. of coke per charge manually and just weighing the iron. Some operators make up a box or container which has the same volume as a 4-in. section of the stack, and they fill this to the top or to a mark each time.

It's simple, however, to weigh up your coke charges. To produce fine-grained, unoxidized iron in a small cupola, don't try to squeeze it to death. Melt at a ratio of from 7 to 1 to 5 to 1 iron to coke. Keep your blast volume constant from start to finish. Operate on a fixed schedule to try to keep everything the same throughout the entire heat, using 4-in. coke charges from start to finish. If you change from one iron to

another, make your split 4 in., the usual.

It should be noted that improperly designed, homemade mechanical charging devices often are far inferior to careful hand charging. These devices should be designed, built, and installed by a firm which is in this business.

Bed height will not run up and down the stack as you say it does unless there is marked variation in the operation.

Sincerely,
Charlie

Chicago Chapter of AFS Elects New Officers

Donald E. Meves, senior research supervisor, American Steel Foundries, has been named president of the Chicago Chapter, American Foundrymen's Society. Vice president is Robert C. Johnston, resident manager, Hickman, Williams & Co. William S. Duncan, Pickands Mather & Co., has been re-elected secretary, and Louis J. Jacobs, director of research and development, S. Obermayer Co., was reappointed treasurer.

New directors of the chapter include Herbert C. Aamodt, sales and service, Great Lakes Carbon Corp.; Harold G. Haines, metallurgist, Woodruff & Edwards Co.; John W. Lauder, vice president and treasurer, Aurora Metal Co.; George DiSylvestro, foundry research director, American Colloid Co.; and John C. Mulholland, foundry superintendent, Pettibone Mulliken Corp., who retires as chapter president.

Article Discusses Selection Of Heat-Resistant Castings

A comprehensive article on the factors involved in selecting high-alloy heat-resistant castings for use in temperatures exceeding 1200° F is offered by the Alloy Casting Institute. E. A. Schoefer, executive vice president of the institute, is author of the discussion entitled "A Selection Guide to Heat Resistance Cast High Alloys."

Copies of the 12-page reprint are available from the institute, 1001 Franklin Ave., Garden City, N. Y.

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Today, the Chicago Type 11 Taper Cup, pictured above, is the safest, fastest, most economical wheel for metal fabricators and foundries.

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News Views

GRAND PRIZE: Mike Ernst, coremaker, Electric Steel Foundry Co., Portland, Oreg., was awarded a trip for two for suggesting an improved layout and modernization of a work area in his department. Mr. and Mrs. Ernst visited Philadelphia, New York, Washington, and New Orleans. Mr. and Mrs. Ernst, second and third from the right, are shown at the airport with, from left, their son Bob and Jim Dorigan and Phil Ramage, both of Electric Steel Foundry

SFSA DIVISION 8 MEETING: Director of Steel Founders' Society Division 8, F. G. Frink Jr., right, vice president, Washington Iron Works, Seattle, presided at the division's May 5-6 meeting at Scottsdale, Ariz. Also shown, left to right, are guest speaker I. M. Emery, president, Massillon Steel Casting Co., Massillon, Ohio; George K. Dreher, director, market development, SFSA; and F. Kermit Donaldson, executive vice president, SFSA

FEF SCHOLARSHIP WINNERS: C. F. Strom, left, vice president of research, Griffin Wheel Co., Chicago, and Prof. J. L. Leach, right, faculty advisor to the AFS student chapter at the University of Illinois, are shown with three winners of Foundry Educational Foundation scholarships to the University. Students, from left, are Raymond W. Kotrba, Charlton H. Jones, and Charles H. Ernst

CARVED PLAQUE: Lectromelt Furnace Div., McGraw-Edison Co., has received a letter of commendation in the form of a 3 x 5-ft plaque hand carved from a single piece of wood from a camphor tree 300-400 years old. The letter is from a Japanese manufacturer who owns four Lectromelt furnaces. Shown with the plaque is F. H. Plank, division president

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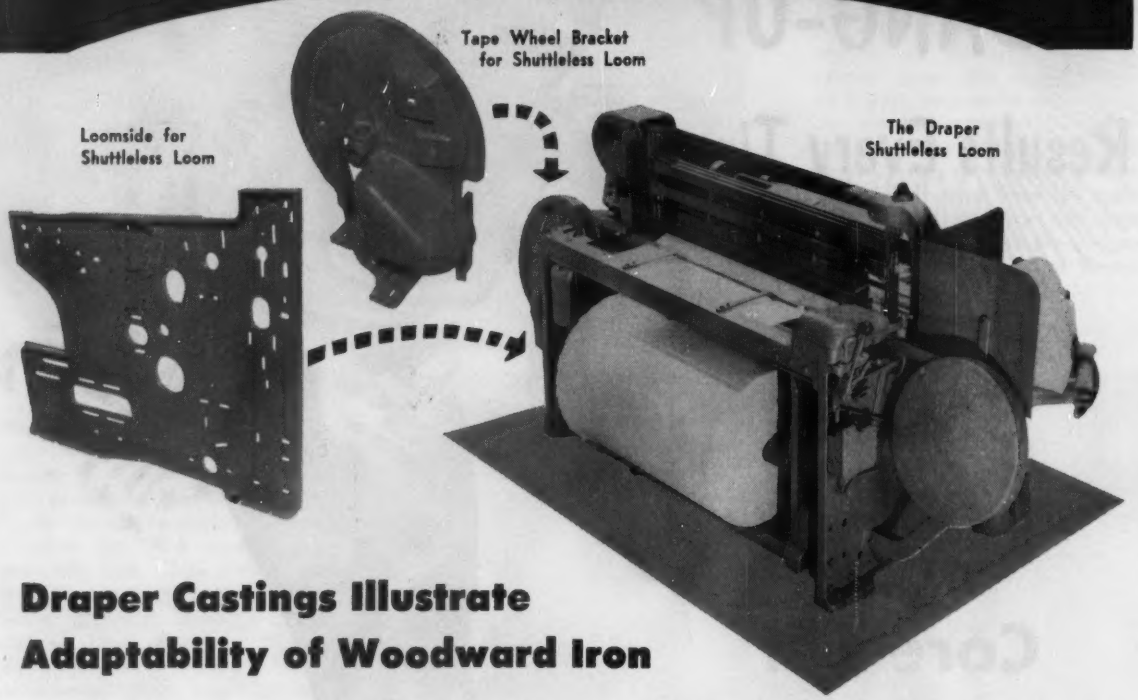

Draper Castings Illustrate Adaptability of Woodward Iron

Adaptability of Woodward iron to the production of complex, precision castings is typified by these illustrations of its use in the manufacture of Draper Corporation's famous automatic looms.

In the Draper shuttleless loom pictured here, Woodward Iron was used in the loomsides and tape wheel brackets.

The Draper Corporation, founded in 1816, is the world's largest builder of automatic looms. Its plant at Hopedale, Mass., covers 38 acres and has a floor area of 1,687,605 square feet. The Company has 7 other branch plants and 7 sales offices and warehouses in various locations in the United States.

In protecting its reputation for producing only castings of highest quality, the Draper Corporation has been always a discriminating buyer of uniform, quality iron.

We are proud to number Draper among the many valued customers who look to Woodward as a dependable source of supply for uniform, versatile iron that meets exacting standards.

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W. V. COMPTON
. . . La Porte Foundry Co. appointments

PAUL G. SCHUMM

GLEN T. CAHILL
. . . administrative assistant

HARRIS R. SHIMEL
. . . joins Tiffin Foundry Inc.

W. V. Compton has been named vice president-general manager, and **Paul G. Schumm**, secretary and assistant treasurer, LaPorte Foundry Co., LaPorte, Ind. Mr. Compton was superintendent of Josam Mfg. Co. & Foundry, Michigan City, Ind., until 1958 when he joined LaPorte. Mr. Schumm succeeds **Elmer A. Miller**, who retired recently after 43 years of service.

B. D. Claffey, vice president, Dayton Malleable Iron Co., Dayton, Ohio, has also been named general director of the company's Ohio Malleable Div., Columbus, Ohio, as well as of its G.H.R. Foundry Div., Dayton. He has been general manager at G.H.R. since 1955. **Kenneth Henry**, recently general superintendent, has been made plant manager of the G.H.R. division. D. L. Mains continues as vice president-general manager in Columbus.

William B. Winter has been appointed quality control manager, Bucyrus-Erie Co., South Milwaukee, Wis. Since 1958 he has been assistant general foreman of melting and the brass foundry.

Edward L. Mills has been appointed Huntington, W. Va., district manager, Link-Belt Co., Chicago, succeeding **David W. Stevens**, who has retired after 48 years of service. **Earl W. Habberstad** takes over Mr. Mills' former duties as Duluth district manager.

Glen T. Cahill has been named administrative assistant in charge of advertising, public relations and promotional activities, Hamilton Foundry Inc., Hamilton, Ohio. He joined the company a year ago after two years with Armco Drainage & Metal Products Inc., Middletown, Ohio.

Robert L. Taylor has been appointed sales representative for the Rochester - Buffalo - Syracuse area, Bohn Aluminum & Brass Corp., Detroit.

O. James Crofoot recently joined Runge Foundry Cost Systems, Cleveland, as foundry cost consultant.

A. James Kiesler of the General Electric Research Laboratory, Schenectady, N. Y., recently was awarded the honorary professional degree of metallurgical engineer by University of Missouri School of Mines and Metallurgy. Mr. Kiesler is an alumnus of the school.

Richard I. Allen has been elected vice president, Hills-McCanna Co., Chicago. He will continue as general manager of the foundry division and sales manager of the company.

Dr. Thomas J. McLeer has been made assistant to the vice president, Vanadium Corp. of America, New York. Until recently he was director of research and development, Cooper Alloy Corp., Hillside, N. J.

Harris R. Shimel has been named sales manager, Tiffin Foundry Inc., Tiffin, Ohio. After 25 years with General Motors Corp., where he last was superintendent of aluminum diecasting and forging, Chevrolet Passenger Transmission Plant, Toledo, Ohio, Mr. Shimel was a consulting engineer to the diecasting industry. He was a cofounder and first national president of the Society of Die Casting Engineers, Detroit.

Donald F. Rundle has been named manager of metallurgical development at the Chicago office of Climax Molybdenum Co., Div. of American Metal Climax Inc., New York. He was formerly managing engineer of Chrysler Corp.'s metallurgical research department.

Manley E. Brooks, foundry engineer and consultant, Dow Chemical Co., Midland, Mich., recently received the annual David Ford McFarland Award of the Pennsylvania State University Chapter of the American Society for Metals, which honors Penn State alumni for outstanding achievement in metallurgy.

Robert T. Ferguson has been named technical manager of pig and ingot sales, and **Frederick C. Irving Jr.**, technical manager of casting sales, Aluminum Co. of America, Pittsburgh. Since 1955 Mr. Ferguson has been assistant chief smelting di-

EDWARD C. KLANK
. . . foundry supply sales

MELVIN S. EARL
. . . Bearing Bronze sales mgr.

JACK M. MINORE
. . . becomes v. p.-general mgr.

JOSEPH A. MADDEN JR.
. . . becomes plant supt.

vision metallurgist in Pittsburgh. Mr. Irving has been production assistant in the fabricating division, Pittsburgh, since 1957.

Edward C. Klank has joined Lancaster Foundry Supply Co., Lancaster, Pa., as sales representative. He was formerly with Philadelphia Coke Div., Eastern Gas & Fuel Associates, Philadelphia.

E. G. Clark, Newark, N. J., division manager, has been named regional manager of the Newark, Detroit, and Chicago divisions, Cleco Air Tools, Div. of Reed Roller Bit Co., Houston. Other Cleco appointments include **J. G. Hudson**, assistant to the sales manager, to regional manager for the Houston, Atlanta, St. Louis, and Los Angeles divisions; **R. V. Gillispie**, personnel manager, to manager of sales development; and **J. A. Grundy** to general manager, in addition to his duties as vice president of operations for the parent company. **E. W. Clayton** is Cleco's general sales manager.

Melvin S. Earl has been appointed sales manager, Bearing Bronze Casting Co., Cleveland. He was formerly Ohio representative for Continuous Cast Div., American Smelting & Refining Co., New York.

Jack M. Minore has been elected vice president and general manager, North American Refractories Ltd., Hamilton, Ont., Canada, succeeding **Gordon L. Memory**, who will act as a company consultant. Mr. Minore joined North American in 1936.

Robert E. Bergey has been named sales representative for foundry coke and pig iron, Alan Wood Steel Co., Conshohocken, Pa. He has been with the company since 1937.

J. J. Fitzgibbon has been named sales manager of the Harrison, N. J., office, Whitehead Metals Inc., subsidiary of International Nickel Co., New York. He joined Inco's research laboratory at Bayonne, N. J., in 1935, and was transferred to Whitehead in 1938 as a foundry specialist on nickel alloys. In 1953 he became foundry department product manager.

Joseph A. Madden Jr., formerly foundry manager, Burnham Corp., Lancaster, Pa., has been named plant superintendent, Ephrata Mfg. Co., Ephrata, Pa.

R. D. Brown has been named western regional manager, Hills-McCanna Co., Chicago, with headquarters in Pasadena, Calif. **William Loomis** has been made sales engineer, with offices in San Leandro, Calif.

E. E. O'Connor, since 1934 in coal sales with Hickman, Williams & Co., Cleveland, has been named resident manager to cover sales of pig iron, coke, shot and grit, clay, etc., in Cleveland and northeastern Ohio.

G. E. Smith, formerly sales representative in the Cleveland district, Union Carbide Metals Co., Div. of

E. G. CLARK

J. G. HUDSON

R. V. GILLISPIE

J. A. GRUNDY

. . . Cleco Air Tools appointments

ACME STEEL'S IDEA INCLUDES WHITING CUPOLAS

Two Whiting hot blast cupolas—the largest in the world—comprise the operational backbone of Acme Steel Company's unique new steel plant in Chicago. With base plate shell diameters of 156" and effective hearth diameters of 114", the eight-story high water-cooled units work in conjunction with oxygen converters to produce high-quality steels in multiple small-order batches. Each of the cupolas has an hourly capacity of 50 tons of metal. Supplementing them is a variety of other Whiting foundry equipment—charging trolleys and buckets, hot metal mixers, ladles and hoppers—all helping to provide a capacity of 450,000 ingot tons a year at this new steel making facility.

For the complete story of this plant, the only installation of its kind in this hemisphere, write for your copy of the WHITING FOUNDER, Winter issue. *Whiting Corporation 15607 Lathrop Avenue, Harvey, Illinois.*

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Are you a tough customer when it comes to quality in the metal you buy? Olin Aluminum casting alloys are just what you've been looking for. We supply primary metal of the highest purity coupled with excellent grain refinement, enabling you to obtain better physical properties in your castings.

MORE EFFICIENT FORMS. Olin Aluminum casting alloys come in 10, 25, and 50-lb. sizes. Ten and 25 pounders feature smaller size to facilitate crucible charging, speed handling and melting. Deep notches and 4-section design for easier breaking.

Remember, Olin Aluminum doesn't sell castings; we simply want to help you to produce better castings. For quality, service and dependability — call your Olin Aluminum office or distributor.

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OLIN ALUMINUM

KERMIT A. SKEIE
. . . new Magnaflux post

DONALD E. MEVES
. . . Chicago Chapter pres.

WILLIAM J. KILLIAN
. . . Pittsburgh mgr., Vanadium

DAVID J. PEZDIRTZ
. . . joins Globe Steel Abrasive

Union Carbide Corp., New York, has been appointed salesman in charge of the Detroit office.

Kermit A. Skeie has been transferred to Chicago headquarters of Magnaflux Corp. to head commercial inspection services. **Richard Turner** has succeeded Mr. Skeie as western region manager at Los Angeles, a post the latter had held since 1955. **Denis P. Walsh,** former midwest region manager, becomes manager of distributor and representative sales. **Robert G. Strother** has been named to head field engineering in Chicago, and his former duties as New York branch manager are taken over by **Henry Bogart. Norm Sonderman** continues in charge of field engineering on government sales contracts.

Donald E. Meves, elected president of the Chicago Chapter of the American Foundrymen's Society for 1960-61, is senior research supervisor, American Steel Foundries, East Chicago, Ind. He was with the Falk Corp., Milwaukee, from 1947 until 1950 when he joined West Michigan Steel Foundry Co., Muskegon, Mich., as chief metallurgist. He has been with American Steel Foundries since 1953.

William J. Killian has been named manager of the Pittsburgh district, Vanadium Corp. of America, New York. **Harry E. Orr,** commercial vice president of engineering sales, has been acting manager since 1956. Mr. Killian has been his assistant.

Donald L. Archibald has been appointed Pittsburgh district manager, Joy Mfg. Co., Pittsburgh. He has been New York district manager. **Alden T. Bloxham** has been named manager of the Industrial Division's fan sales, with headquarters in Pittsburgh. He had been in the San Francisco office.

David J. Pezdirtz, formerly metallurgical research engineer, Battelle Memorial Institute, Columbus, Ohio, has been appointed chief metallurgist and manager of metal abrasive quality control, Globe Steel Abrasive Co., Mansfield, Ohio.

Charles B. Saunders, sales consultant, Tennessee Products & Chemical Corp., Nashville, Tenn., retired recently. Previous connections include Tennessee Coal, Iron & Railroad Co., Fairfield, Ala., where he was foundry metallurgist; Lone Star Steel Co., Dallas, Tex., assistant sales manager, and Woodward Iron Co., Birmingham, sales representative. He was chairman of the Birmingham District Chapter of the American Foundrymen's Society in 1938-39.

Don F. Hillmer has joined the Resins and Chemicals Dept., Borden Chemical Co., Div. of the Borden Co., New York, with headquarters

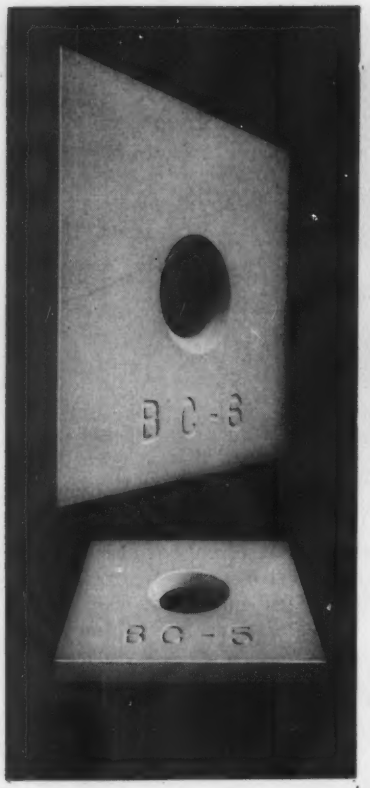
R. C. O'KANE

W. W. HEIMBERGER

G. T. JOHNSON JR.

L. I. DAY

R. C. O'Kane was elected president-general manager, W. W. Heimberger, vice president-operations, G. T. Johnson Jr., vice president-sales, and L. I. Day, treasurer and asst. secretary of Buckeye Steel Castings Co., Columbus, Ohio, as reported in June



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Circle 672 on Page 53

in Elmhurst, Ill., at the midwest sales office. **Gene R. Foust** will represent the department at the regional sales office in High Point, N. C.

Wallace D. Huskonen has joined the FOUNDRY staff as an assistant editor after graduating from Case Institute of Technology. A Foundry

WALLACE D. HUSKONEN
. . . joins FOUNDRY staff

Educational Foundation scholarship holder, he received his degree in metallurgical engineering. Mr. Huskonen has worked summers for Andover Pattern Co., Andover, Ohio, and for Forest City Foundries Co., Cleveland. He was co-editor of *The Engineering and Science Review*, Case's student quarterly.

Wayne N. Vanderhoof has been named president of the recently formed Interstate Abrasives Inc.,

WAYNE N. VANDERHOOF
. . . heads Interstate Abrasives

Chicago, distributor in the Chicago area for Peninsular Grinding Wheel Co., Detroit. He has specialized in grinding wheel applications for several years.

Radiography Use Growing For Testing of Castings

Active Research Furthers Advances of Recent Years

By Peter W. Sherwood

TECHNIQUES involving the passage of very short waves through metals are today a rapidly growing method for the nondestructive testing of castings. Important advances have been made in this field during the last ten years, and active research continues.

The important advantage of radiography is that it permits measurement at considerable depth within the test material. To permit such penetration, it is necessary to use waves of high frequency. Customarily x-rays or gamma rays are employed. The principal difference is the source of the radiation.

X-ray examination, which has been available for a much longer time and has become standard in numerous industrial acceptance tests, depends for its radiation on the emission from metal (usually tungsten) which is bombarded with electrons by applying a high electric potential to an evacuated tube. Gamma rays are the spontaneous emanation of certain isotopes; in nondestructive testing methods, the use of cobalt 60 and iridium 192 as a convenient source of gamma rays has, of late, come to the fore.

Test Scope Wide—The wide scope of tests which may be carried out by radiographic methods has been illustrated by Van Horn[1] for the specific case of determination of discontinuities in cast and wrought products. Van Horn lists the following possible measurements:

1. Gas: Gas holes; gas porosity.
2. Shrinkage: Shrinkage cavity; shrinkage porosity or sponge (nonferrous alloys); and microshrinkage (magnesium-base alloys).
3. Heterogeneities: Foreign materials; segregations.
4. Sharp Discontinuities: Hot cracks; cold cracks; cold shut.
5. Miscellaneous: Surface irregularities; misruns; core shift.
6. Weld Discontinuities: Incomplete joint penetration; undercut; porosity; slag; cracks.

The principle of radiographic measurement involves a determina-

tion of the extent to which the rays are absorbed in the course of passage through the test piece. Such absorption is a direct function of the thickness of metal through which the radiation must pass. Presence of a flaw in the path of the rays decreases the total metal thickness when compared with an adjacent flawless path. The outline of a flaw therefore shows up on a photographic plate somewhat darker than its surroundings.

X-rays have various advantages over gamma rays. Notable among them is the shorter period of exposure required (a few minutes vs. 15-24 hours) and the better contrast which can be obtained with x-rays. Against this, x-rays call for the use of fairly costly equipment. Furthermore, only one test piece can be exposed at a time since the rays are unidirectional while a gamma-ray source radiates in all directions.

Equipment Portable — On the other hand, a gamma-radiator is a very small source (properly shielded to protect the operator). It can be used in numerous locations where x-ray equipment cannot be mounted. The equipment itself is relatively inexpensive, consisting merely of a number of film holders, means for fixing the specimens in the desired positions, and a stand for holding the container of the radioactive sources.

The practice for visual, qualitative inspection of welds by x-rays is incorporated in several construction codes. Recently, attempts have been made to develop quantitative correlation between the radiographic and the mechanical properties (notably strength characteristics) of the specimen. A valuable attempt in this direction has been reported by Masi[2].

Masi calls for three test conditions which must be fulfilled to meet his methods requirements:

1. The intensity of the x-ray beam should be uniform, or of known intensity distribution over the entire field.

2. The defect must be of uniform physical character; for example, the presence of slag filling the void will introduce an error.

3. The maximum cross section of the defect should be parallel or perpendicular to the x-ray beam.

For these conditions, Masi has developed correlation curves which permit a fairly reliable estimate of tensile strength in terms of the radiograph. Such a quantitative correlation may eventually reduce the number of rejects which are made necessary under present methods if the radiographed parts show evidence of defect.

The high cost of radium and short life of radon have been responsible for the limited amount of interest which these two gamma ray emitters have attracted for nondestructive testing methods. New horizons are opened by the two gamma ray sources, iridium 192 and cobalt 60.

Iridium Applications—Garrett et al[3] have discussed some of the possibilities and attractions of iridium 192 for radiographic purposes. The gamma rays emitted by this isotope are such as to make this source most suitable for sections of steel up to, say, 1.5 to 2 in. At the same time the low energy level reduces the extent of protective measures which must be taken for the operator's safety.

A suitable shape for the metal is a cylinder of 3 mm diam x 3 mm long. The gain in radiation by going to larger dimensions is insufficient to warrant the greater cost for many applications.

The rays emanating from iridium are attenuated into desired conical shape by passage through a suitably shaped aperture in a lead block. After passage through the specimen, the rays impinge on a photographic plate or a fluorescent screen which may be safely viewed in a mirror.

Garrett determined the sensitivity of iridium gamma rays for various test materials and shapes. By sensitivity is meant the thinnest section which can be seen on a fluorescent screen when irradiated. It is found that flat shapes are more easily detected than circular ones, and spherical forms are most difficult.

For a given shape, the sensitivity decreases with increasing thickness along a curve which reaches a nearly asymptotic minimum.

Iridium 192 as a source of gamma rays has the advantage of higher radiation output than either radium or cobalt 60. Garrett points out further that the lower average energy of iridium's radiations provides better contrast in the radio-

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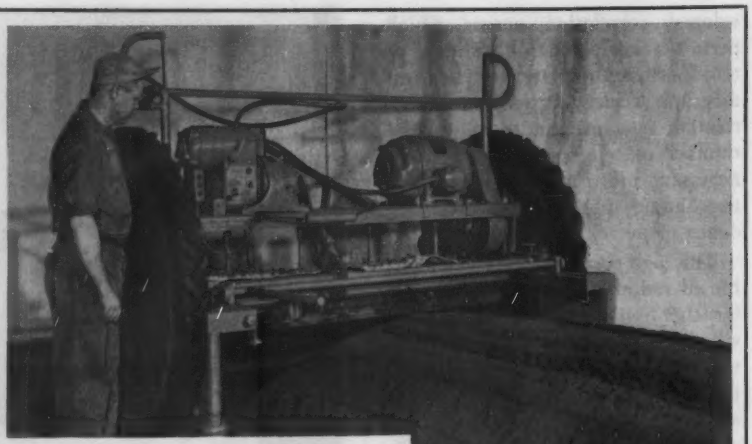

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Circle 675 on Page 53

graph, better sensitivities up to a steel thickness of 2 to 3 in., and results in a less formidable shielding problem.

The main disadvantage in its use is its relatively short halflife which necessitates fairly frequent change of the radiation source.

The technique lends itself also to stereoradiographic investigations. Such an approach, made possible by the relatively high speed of iridium radiography, permits accurate location of voids and flaws in the interior of welds and metals.

A valuable paper by Schwinn[4] has explored practical applicability of radiography by cobalt 60 in steel welds. This radiation source is valuable for the same reasons of portability and small source size which have been outlined above for iridium 192. Similar techniques are employed in the use of either emitter, except that cobalt requires more elaborate safety precautions.

High Contrast—Schwinn points out that the high intensity of cobalt 60 gamma radiation makes it an ideal source for objects with high subject contrast. It is a cheaper source than radium even when account is taken of cobalt 60's shorter half-life. Originally, the economics of cobalt 60 compared unfavorably with those of x-ray radiography, but the future cost trend is in favor of the cobalt isotope as it becomes more readily available.

For small section thickness (1-in. steel), sensitivity of cobalt 60 radiographs is somewhat inferior to radium which, in turn, is substantially below the sensitivity obtainable with x-ray. However, exposure time needed for cobalt radiation is significantly less than for radium.

As the thickness of the specimen increases, the sensitivity obtainable with cobalt becomes equal to, and (above 2 in.) even better than that with radium. Here, the factor of exposure time becomes even more pronouncedly in favor of cobalt 60.

These radiation sources are highly suitable up to a steel thickness of about 4 in. Above this point, much detail is lost in the radiograph. The limit is, of course, set by the demand for detail.

REFERENCES

1. Van Horn, K., ASTM, Special Technical Publication No. 112, p. 83.
2. Masi, O., ASTM, Special Technical Publication No. 145, p. 21.
3. Garrett, C., et al, Ibid. p. 9.
4. Schwinn, W. L., ASTM Special Publication No. 112, p. 112.

Obituary

Foster W. Lamb, 54, general sales manager of Chicago Hardware Foundry Co., North Chicago, Ill., died May 8. He joined the company last year following general sales management experience with Automatic Transportation Co., Div. of Yale & Towne Mfg. Co., Chicago, and Colorado Fuel & Iron Corp., Denver.

William R. Tanner, 68, president of Zenith Foundry Co., West Allis, Wis., died May 18. He attended University of Wisconsin and founded the company in 1926.

Earle C. Smith, 69, chief metallurgist and research director, Republic Steel Corp., died May 20. He became chief metallurgist in 1932 and research director in 1956.

Joseph S. Mohr Sr., 62, regional sales manager for General Refractories Co., Chicago, died May 22. He had held the position since 1935.

Jerome L. Thies, 54, president, Fenton Foundry Supply Co., Dayton, Ohio, died May 15.

Jack L. Martin, 40, development engineer for Superior Foundry Co., Cleveland, died June 5.

Philo A. Orton, 87, president, Orton Crane & Shovel Co., Chicago, died May 22.

Offer Reference Radiographs For Aluminum and Magnesium

Tentative Reference Radiographs for Inspection of Aluminum and Magnesium Castings Series II E 155 are being offered by the American Society for Testing Materials. Thirteen radiographs cover discontinuities in aluminum alloy castings, and 12 cover magnesium alloy castings. Each radiograph illustrates eight grades of severity for a particular discontinuity.

The radiographs illustrate gas holes, segregation, microshrinkage (sponge and feather) and foreign matter in castings ¼ and ¾ in. thick. Illustrations are designated by number according to ASTM standard E 52.

Set can be obtained from ASTM, 1916 Race St., Philadelphia 3, Pa., for $125 each.

GE Offers Book for Use with X-Ray Spectrometers

"X-Ray Wavelengths for Spectrometer," a 448-page book designed for use with an x-ray spectrometer, is available from General Electric Co.

Two sections of the book cover qualitative analysis of elements from observed angles to their identification in terms of element, line or absorption edge designation, wavelength and order of reflection. Tabulations are for crystals ADP, EDT, quartz (6.68), silicon, NaCl, LiF, quartz (2.75), and topaz. Data are in order of increasing Bragg angle and both lambda and n lambda are recorded.

The other eight sections, one for each crystal, are a guide for spectrometer adjustment. Wavelengths are given in angstrom units calculated from date in X-units. Interplanar spacings of crystal analyzers were determined experimentally and checked against published sources.

Book is cloth bound with hard cover and available for $10. It can be purchased through a local GE industrial representative or direct from the X-Ray Dept., General Electric, 4855 W. Electric Ave., Milwaukee, Wis.

Handbook on Control of Costs Offered by Dun & Bradstreet

Dun & Bradstreet has published another booklet in a series of handbooks for small businesses. "How to Build Profits by Controlling Costs" includes such practical aids as simple directions for computing operating and financial ratios and a five-year chart for comparing performance.

First part of the 48-page booklet uses a case history approach to common problems. Second part is a step-by-step examination of record-keeping, analysis of figures, and use of ratios to compare performances.

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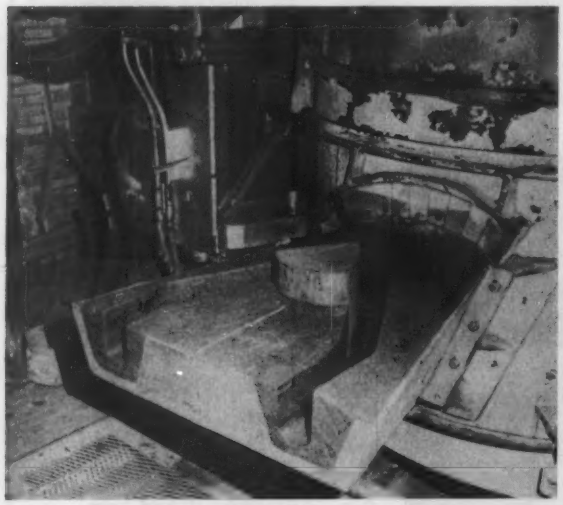
IN 1951, Compton Foundry, Compton, Calif., installed a 5-ft Rotoblast table-room blast cleaning unit made by Pangborn Corp., Hagerstown, Md., and cut cleaning costs by a reported $8628 a year. The new equipment thus paid for itself in about 8 months and has been saving about $719 monthly ever since. The foundry averages about 110 tons of castings a month.

A further benefit has been better cleaning, which makes inspection easier and raises product quality. Floor space required also was reduced. The table-room unit handles castings varying from less than 1 lb to 5000-lb parts 6 ft in diam and 3 ft high. Because there is no tumbling of work, the machine is ideal for fragile parts. It hurls a total of 50,000 lb of metallic abrasive per hour.

For More Details Circle No. 517—Page 53

Device Developed for Comparison Testing

A THREE-TON, three-phase electric arc steel melting furnace at the Pilot Plant, Vanadium Corp. of America Research Center, Cambridge, Ohio, has been



equipped with a bifurcated spout. This accessory makes it possible to tap large-scale experimental heats into two adjacent ladles simultaneously and at equal rates. Alloy additions can be made to either ladle or both, and the effectiveness of the additions can be determined accurately.

For More Details Circle No. 518—Page 53

Maintenance Crews Use Portable Work Bench

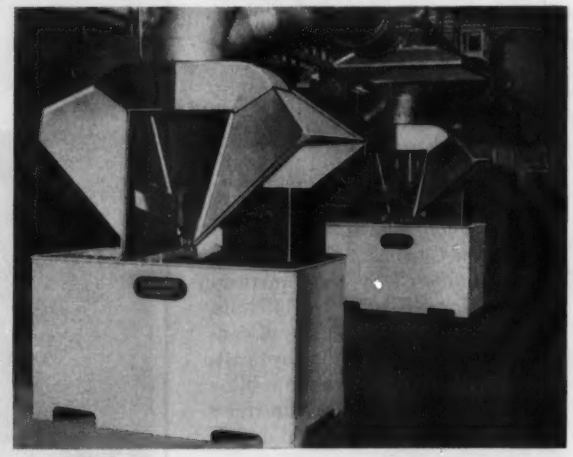
A PORTABLE work bench is used by maintenance crews at Timken Roller Bearing Co.'s Steel & Tube Div., Canton, Ohio. The unit features a good working surface and carries a variety of tools, such as bars, heavy wrenches, and sledge hammers. The crews move

their tool kits to and from jobs in the bench. It has three wheels and can be pulled or carried by lift truck. Manufacturer is Stahl Metals Products Co., Cleveland.

For More Details Circle No. 519—Page 53

Plant Installs Two Induction Furnaces

TWO 80-KW two-chamber melt and hold induction furnaces made by Lindberg Engineering Co., Chicago, recently were installed at Electrolux Corp., Old Green-



wich, Conn. Furnaces are for diecast aluminum vacuum cleaner parts. Cleanliness and good working conditions of the plant have been maintained because of the absence of noise and burner heat in the installation.

Unique furnace hoods remove accumulated gases, and ideal casting temperatures are said to be maintained easily. Two more units are being installed.

For More Details Circle No. 520—Page 53

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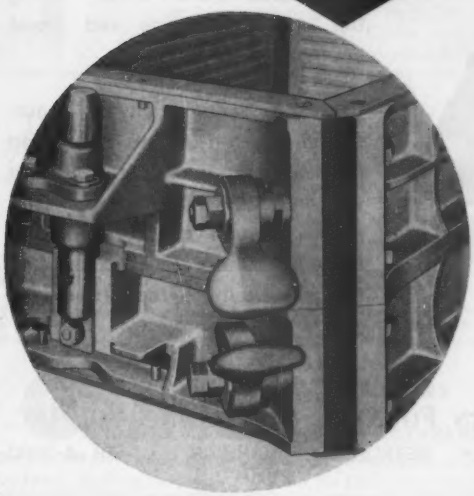

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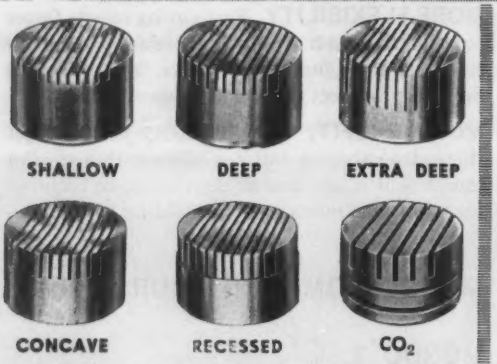

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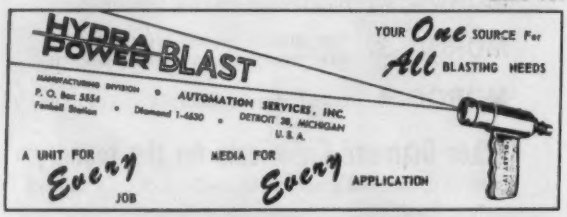
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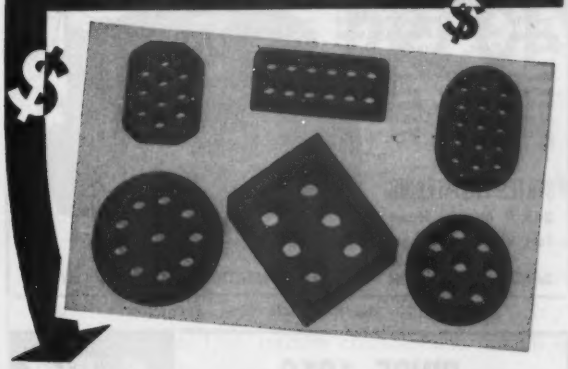

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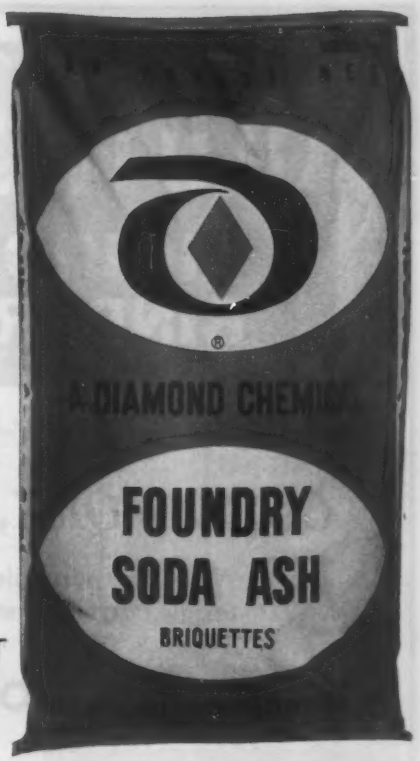

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THE RINGLIFT CONDITIONER WILL CONDITION YOUR SAND WITH TIME TO SPARE

The Ringlift can easily handle many floors because it conditions up to a ton of sand per minute. It's thorough even though it's fast. Picks up sand from floor, screens, cools and aerates it. Magnetically separates metal. Moistens sand and returns it to floor in neat windrows. Clean, quiet, economical. Send for literature.

STATES ENGINEERING
245 E. Murray Street
Fort Wayne, Indiana

SAND PREPARATION • MECHANIZATION • PLANT LAYOUT

Circle 686 on Page 53

SINCE 1919
A RELIABLE SOURCE
of

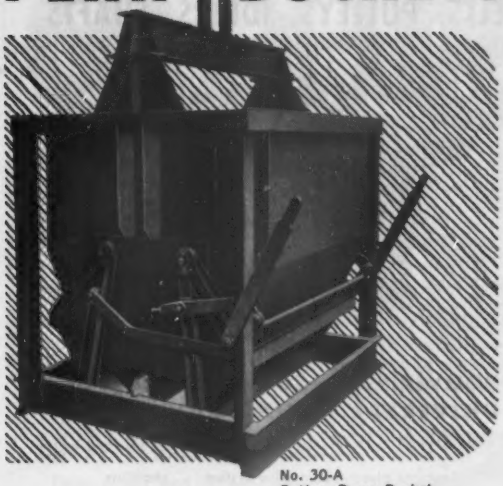
QUALITY PATTERNS, SHELL MOLDS, PERMANENT MOLDS AND DIE CASTING DIES.

CENTRAL PATTERN CO.
QUINCY, ILL. TELEPHONE: BA 2-0947

40th YEAR AT THE SAME STAND

Circle 687 on Page 53

PENN BUCKETS



No. 30-A
Bottom Dump Bucket

Exclusive design makes this bottom dump bucket easy to operate . . . easy to open. Efficient for foundry use in handling all types of sand, moulding or core, dry or prepared. Can be used with coke, scrap iron and castings also. Sizes 7 to 200 cu. ft.

Write Today for Catalog • Prices Quoted on Application

PENN IRON WORKS, INC.
READING, PENNA.

Circle 688 on Page 53

Over 60 years
Service to Industry

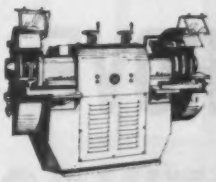
GRINDERS

EASIER, FASTER, MORE ECONOMICAL FOR ALL GRINDING OPERATIONS.

Swing Frame Grinder

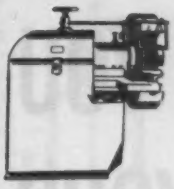
Portable 1/3 to 7½ hp

America's Greatest and Most Complete Line



Dual Motor Vari-Speed Grinder

Write for catalogs and new bulletins



Vari-Speed Single End Grinder

General Purpose Grinder

The United States Electrical Tool Co.
3640 LLEWELLYN ST.,
CINCINNATI 23, OHIO

Circle 689 on Page 53

PRECISION CASTING

Increase your profits with DFC crucibles & funnels

Since 1876, DFC has furnished crucibles, clay goods, and accessory materials which have set *standards of quality the world over*. More recently the unanimous acceptance and wide use of DFC transfer crucibles and funnels by the precision casting industry, is high testimony to their economy and dependability.

For precision casting...lost wax, investment and permanent mold. Transferring, pouring, spouting... there is a DFC crucible or funnel to meet your exact needs.

If you have a special crucible problem, let us work on it for you.

Denver Fire Clay Company

DENVER • SALT LAKE CITY • NEW YORK

The DENVER FIRE CLAY COMPANY DFO-5
3039 Blake Street, Denver 17, Colorado

Please send me further information on your full line of crucibles.

Name.....

Company.....

Address.....

City and State.....

Circle 690 on Page 53

YOU IMPROVE YOUR CASTINGS

when you cast aluminum and magnesium with B&A® Alkali Fluoborates

(and Potassium Titanium Fluoride)

WHEN YOU CAST ALUMINUM

You can remove oxides and improve molten fluidity with B&A Potassium Fluoborate. It acts as a purifying flux and degassing agent . . . forms a dry dross.

You can produce a better grain structure in the casting by subsequent treatment with B&A Potassium Titanium Fluoride, or a mixture of Potassium Titanium Fluoride with Potassium Fluoborate (for lower melting temperatures). This improved grain results in increased tensile strength, greater elongation, better machinability, and other advantages.

WHEN YOU CAST MAGNESIUM

You can reduce rejects with B&A Alkali Fluoborates used as oxidation inhibitors with both green sand and core sand. You will also find cores easier to make and easier to shake out—and they collapse faster.

For further information, test samples, or technical assistance, write today on your company letterhead.

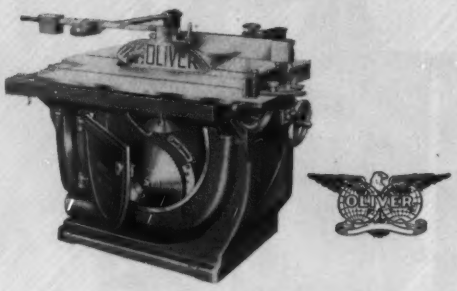
B&A STANDARD OF PURITY

Allied Chemical

GENERAL CHEMICAL DIVISION
40 Rector Street, New York 6, N. Y.

BAKER & ADAMSON® Fine Chemicals

DIRECT MOTOR DRIVE ELIMINATES BELTS, PULLEYS, IDLERS, SHAFTS



"OLIVER" NO. 260 DOUBLE ARBOR UNIVERSAL TILTING SAW BENCH

Features direct motor drive system . . . shaftless motor is built-in directly on each of the two ball bearing saw arbors, in a self-contained, compact, unit fashion. Change from rip saw to cross-cut saw by the turn of a wheel. Two saw arbors, one carrying 16" diameter rip saw, the other a 16" diameter cross-cut saw.

OLIVER MACHINERY COMPANY
GRAND RAPIDS 2, MICHIGAN

Circle 692 on Page 53

FOUNDRY CONSULTANTS

APPRAISALS . . . WAGE INCENTIVE PLANS . . . COST SYSTEMS . . . EXECUTIVE CONTROL . . METHODS PRODUCTION CONTROL SYSTEMS . . . PLANT REMODELING . . PLANT DESIGN . . CONTINUOUS SYSTEMS . . . SEMI-CONTINUOUS SYSTEMS . . . PRESENT OPERATION MODERNIZED

EDWIN S. CARMAN, INC.
1645 LEE ROAD CLEVELAND 18, OHIO

Circle 693 on Page 53

EMPIRE*

"THAT GOOD" FOUNDRY COKE

DEBARDELEBEN COAL CORPORATION
2201 First Ave., North • Birmingham 3, Ala.
Phone: ALpine 1-9135
*Reg. U. S. Pat. Off.

Circle 691 on Page 53

Circle 694 on Page 53

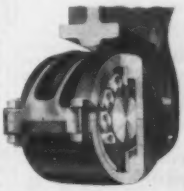
For dependable service, specify CHASE Industrial Wheels, Axles, Bearings and Brackets

High-strength gray iron wheels are available in a wide range of sizes and styles, including single and double flanged, flat face, and rubber, plastic or composition tired.

Wheels can be equipped with Chase flexible bearings or Timken, ball, bronze or other bearings of your choice. Axles and attaching brackets are available for all styles of wheels.

CHASE FLEXIBLE BEARING

Dust-proof and oil-retaining, this trouble-free bearing has kept cars and trucks rolling smoothly through thousands of plants in the U. S. for many years. Its simple but effective design keeps maintenance problems at a minimum.



Chase

Send your specifications for a prompt price quotation or write for bulletin.

FOUNDRY & MANUFACTURING CO.

2900 Parsons Avenue, Columbus 7, Ohio

Circle 695 on Page 53

CENTRIFUGAL CASTING INCREASES PRODUCTION

You can save as much as 25% in labor costs while increasing your production as much as 35% by making castings centrifugally. Highest quality castings, a minimum of rejects, and use of unskilled labor contribute to more profitable operation. It will pay you to ask for complete information.

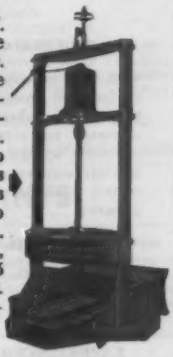
CENTRIFUGAL CASTING MACHINE COMPANY
P. O. BOX 947 TULSA 1, OKLAHOMA

Circle 696 on Page 53

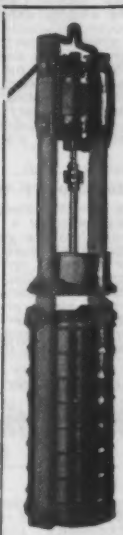
PRECISION-PERFORMANCE AT LOWEST COST! COMBS GYRATORY RIDDLES

"Greatest Name in Motion"

TYPE "CS". Complete price $395.00. 24" square sieve. A continuous operation sieve. Requires no dumping, as refuse is ejected off to one side. Height 4'10", weight 295 lbs. ½ H.P. enclosed motor.



TYPE "CR". Complete price $385.00. 24" dia. round sieve. Sifts, fluffs, mixes, aerates sand. Height 4'6", weight 250 lbs., 1/3 H.P. enclosed motor.



TYPE "HL". Price $285.00 complete, less sieves. Laboratory model especially designed for laboratory sand control, fitted with 1/6 H.P. enclosed motor.

PROMPT DELIVERY from your Foundry Supply House

TYPE "V". Price, 20" Sieve, $300.00. Does the work of 10 men. Screens sand, Fine, Medium, and Coarse. 20" dia. sieve with special clamp for 5-second changes. Height 4'6", weight 100 lbs., fully-enclosed 1/6 H.P. motor. Also available in Giant V-5 with 36" sieve for triple capacity . . . Price $545.00.

MAIL THE COUPON NOW!

GREAT WESTERN MFG. CO.
Leavenworth, Kansas Phone MU-22291

☐ Send Additional FREE Information

NAME

ADDRESS

CITY STATE

Circle 697 on Page 53

CLASSIFIED ADVERTISING

• HELP WANTED

TROUBLE SHOOTER FOR BRAZILIAN FOUNDRY

Engaged in production of Engine Castings for automotive industry. Must be EXPERIENCED IN ALL PHASES OF FOUNDRY. Age 40 to 50. Duration of job from one to two years. Salary open. Send complete resume to . . . . .

WILLYS—OVERLAND DO BRAZIL
ATTENTION . . . . . ISADORE MUTSALAVICH
CAIXA POSTAL 8610
SAO PAULO, BRAZIL

INDUSTRIAL ENGINEER

With the necessary experience, background and interest to establish and head up the Industrial Engineering Department for a large gray iron and malleable foundry. Must be thoroughly familiar with standards, estimating, incentive wage payments and process engineering.

BOX 420, FOUNDRY

PENTON BLDG., CLEVELAND 13, O.

EXPERIENCED METALLURGIST

Needed to head up the melting and metallurgy department of an Eastern production foundry; capacity 300 tons of gray iron daily. Must be capable of directing physical and chemical testing and melting. We are looking for a forward looking type of person who has kept abreast of the latest developments. Interesting and challenging work, liberal benefits, salary open. Send complete resume and references. Address: Box 443, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT WANTED

For a small capacity Electric Steel Foundry. This is a foreign assignment for a three year engagement. Living conditions are good. Salary $18,000 per year, first class passage and 3 months terminal leave with pay on completion of engagement. Superintendent must be a competent Steel Metallurgist and experienced Electric Furnace Operator. In reply please give full outline of past experience, age, whether married or single. Address: Overseas Industrial Services, 681 Market Street, San Francisco, California.

PLANT MANAGER'S ASSISTANT

For cast iron plumbing fixture plant, needs rounded out knowledge to back up manager. Address: Box 429, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES ENGINEER

Experienced in steel castings. Chicago and surrounding area. Good opportunity for right person. Address: Box 424, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FLOOR MOLDING FOREMAN

Wanted by long-established foundry in Southwestern Ohio. Must have supervisory experience and be thoroughly familiar with stainless steel casting. Position offers top wages and excellent working conditions to right person. Pension, many fringe benefits, including excellent insurance program. Send complete resume. Address: Box 439, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERVISORS

Immediately available positions for experienced individuals in supervising core room operations and various molding operations of a midwest gray iron foundry. Please send resume with qualifications and salary requirements to

BOX 432, FOUNDRY

PENTON BLDG., CLEVELAND 13, OHIO

• HELP WANTED

DIE CAST ENGINEER

For aluminum and magnesium. Must be thoroughly acquainted with die design and gating together with experience in running a production operation. Send resume, in confidence, including salary requirements.

BOX 436, FOUNDRY

PENTON BLDG. CLEVELAND 13, OHIO

WORKING FOREMAN

For small nonferrous foundry producing commercial and aircraft quality castings. Must be thoroughly qualified and have background in both sand and permanent mold castings. Excellent opportunity.

QUALCO CASTINGS CORPORATION
P. O. BOX 526 ACWORTH, GEORGIA

ENGINEER

With substantial foundry design and layout experience. Knowledge of modern materials handling equipment and material flows required. Real opportunity with excellent salary, bonus and profit sharing. Degree is essential. Send complete details in confidence.

BOX 410, FOUNDRY

PENTON BLDG. CLEVELAND 13, OHIO

WANTED

Experienced Steel Foundry Molding Foreman. Must know heading and gating. Excellent opportunity. Chicago area. Address: Box 408, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOREMAN—FINISHING

Cleveland nonferrous foundry seeking experienced finishing supervisor. Knowledge of heat treating, sand blasting, stationary and disc grinding chipping, rotary filing, Zyglo inspection and blueprint reading necessary. Understanding of time study helpful. Send complete resume to . . . . .

BOX 418, FOUNDRY
PENTON BLDG., CLEVELAND 13, OHIO

METALLURGIST

24—30 years. Some experience. For small plant in Western Michigan, gray iron specialties. Splendid opportunity and future for right man, willing to work and assume responsibilities. Send complete resume in first letter. Address: Box 425, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN

20 years' experience, 9 years' sales and service. Supervisory experience latest automatic molding units and all phases of foundry operation. Know cupola, air furnace, sand control and rigging. Sales or superintendent position desired in gray iron or malleable foundry. Presently employed as Assistant Superintendent. Address: Box 440, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY FOREMAN

For portable slinger molding floor. Must have sound technical and supervisory experience for production of steel castings weighing to 7½ tons. This is a permanent position with a well established and progressive concern. Please submit complete resume to. . .

CRUCIBLE STEEL CASTING CO.
MR. RALPH C. STEINMEYER
2850 SOUTH 20TH STREET
MILWAUKEE 15, WISCONSIN

• HELP WANTED

CHIEF MELTER

Experienced electric arc furnace. Acid practice—carbon, low alloy and stainless steels—full charge of furnace and ladle practice. Induction furnace experience helpful. Salary open. West Coast location. All answers strictly confidential. Address: Box 413, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PATTERN ENGINEER

Experience with automotive gray iron castings. Must know shell practice and handle pattern shop personnel. Unusual opportunity for right man. Address: Box 417, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• POSITIONS WANTED

CORE ROOM SUPERVISOR

Competent and progressive. Good record. Know sand mixes, steel and gray iron. Qualified to take complete charge. Any location. Address: Box 447, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT-MANAGER

Graduate Metallurgical Engineer—Experience in iron and steel, cupola, electric furnace and open hearth operations. Cost and quality minded. Seeking permanent position. Presently employed as Foundry Manager. Address: Box 407, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN

Are you considering retirement or are you expanding and need a partner? Graduate Engineer, early thirties, desires to invest capital and actively manage small operation. Ten years' experience in Manufacturing and sales of steel and irons. Address: Box 406, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGER-SUPERINTENDENT

Technical and practical knowledge of all phases of ferrous and nonferrous jobbing and production foundries. Metallurgical and sales background. 22 years' supervisory experience. Results assured. Not a degree man. $15,000 minimum. Age 47. Now employed. Address: Box 411, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

COREROOM FOREMAN

Thorough knowledge of all phases of core room operations. Handle highly mechanized shop, very cost conscious. Now living in California, would like to locate on West Coast. Address Box 453, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN

20 years' general gray iron experience. Basic and acid cupola and metal control, casting and sand control. Age 49. Address: Box 444, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT OR MANAGER

Practical foundryman, nationally known for a job well done. Age 48. Good health. Now employed. Looking for more action ferrous or nonferrous, $15,000 minimum. Address: Box 414, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOREMAN

30 years' experience nonferrous foundry. Industrial, ornamental, architectural, tablet and memorial castings. Green sand, skin dry and French sand molding. Presently employed. Desire Change. Address: Box 438, FOUNDRY, Penton Bldg., Cleveland 13, Ohio

---

MANAGER—SUPERINTENDENT

Ferrous and/or nonferrous, 39 years of age with 13 years of extensive foundry experience. B.S. Degree Metallurgical Engineering. Qualified to handle all phases of found y operations. Detailed resume on request. Address: Box 434, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

ESTABLISHED REPRESENTATIVE

With following in Chicago and Northern Illinois area. Now representing Gray iron foundry, 1-2000 lbs. Desires to represent reliable steel and malleable foundry and nonferrous or any allied lines. Address: Box 409, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• POSITIONS WANTED

FOUNDRY TROUBLE-SHOOTER

Former foreman and superintendent. Thoroughly experienced and expert on sands, facings and gating. Qualified for spot trouble-shooting with gray iron and alloys experience. Desire part time employment. Address: Box 415, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES MANAGER

PRESENTLY EMPLOYED AS SALES MANAGER BY LEADING AIRCRAFT STEEL FOUNDRY. PREVIOUSLY ASSISTANT SALES MANAGER FOR 200 TON A DAY GRAY IRON-NODULAR IRON PRODUCTION SHOP. DESIRES POSITION AS SALES MANAGER FOR AGGRESSIVE GROWTH COMPANY. EXCELLENT BACKGROUND AS APPRENTICE, ASSISTANT SUPERINTENDENT, CHIEF METALLURGIST, MARKET ANALYST, CONTRACT PROPOSAL, ADVERTISING AND SALES MANAGER. AGE, 43. MARRIED. SALARY $15,600. ADDRESS: BOX 446, FOUNDRY, PENTON BLDG., CLEVELAND 13, OHIO.

QUALITY CONTROL MANAGER

A.S.Q.C. Member. 10 years' experience nonferrous foundry and finishing plant. Ornamental and industrial castings. Pattern making, core making, and customer acceptability analysis. Presently employed. Will relocate. Address Box 437, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY MANAGER-SUPERINTENDENT

Graduate foundryman experienced in all phases of gray iron mechanized foundry operations, up-to-date on latest developments and methods, cost and quality minded, now employed, desires relocation including overseas assignment. Address: Box 450, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

GENERAL FOREMAN

Twenty-seven years' practical experience in gray iron foundry. Have supervised both jobbing and high production work. Well versed in cupola operation, sand control, gating & rigging patterns. Address: Box 421, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT

30 years' ferrous, nonferrous foundry experience. Nineteen years in top supervisory capacity. Presently employed. Will consider overseas assignment. Address: Box 445, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT

Thirty-four years' experience, ferrous and nonferrous practical and technical, twenty years' supervisor. Prefer small shop. Now employed. Age 55. Address: Box 449, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES ENGINEER

Age 37. Degree. Desire position selling to or for Foundry industry from New York Metropolitan base. Eight years' nonferrous, sales, operations, management. Machine Shop and Pattern. Minimum salary $10,000/year. Address: Box 452, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

QUALITY CONTROL SUPERVISOR

Technical and Statistical Quality Control background in ferrous and nonferrous. Experienced in metallurgy, sand control, gating and risering, customer contact. Able to direct and maintain casting quality. Desires to relocate. Address: Box 448, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN

Experienced in gray iron and nonferrous metals, mechanization, design, patternmaking, gating, risering, costs. Presently employed as pattern supervisor. Address: Box 454, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CORE ROOM FOREMAN

Age 39. Twenty-one years' experience in core room. Thirteen years as supervisor. Both iron and steel jobbing work. Desires position with future. Address: Box 427, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

DOES YOUR TOP MANAGEMENT TEAM

need a resourceful, aggressive and intelligent individual with imagination, productivity and integrity plus a diversified gray iron foundry experience. Production and jobbing (up to 20 tons). Engineer graduate with added business education. Journeyman, Middle thirties. Currently earning $11,000. Will go anywhere for challenging position with growth potential.

BOX 430, FOUNDRY
PENTON BLDG., CLEVELAND 13, OHIO

• EMPLOYMENT SERVICE

FOUNDRY PERSONNEL SPECIALISTS
National Placement and Procurement of
GENERAL AND PLANT MANAGERS, PLANT SUPERINTENDENTS, FOREMEN—ALL DEPARTMENTS, METALLURGISTS, ENGINEERS, CONTROLLERS, ACCOUNTANTS, SALESMEN, SALES MANAGERS, PERSONNEL DIRECTORS, PURCHASING AGENTS
Confidential Inquiries Invited
From Employers and Qualified Applicants
For Fast Competent Assistance Contact

DRAKE PERSONNEL, INC. **FINANCIAL 6-8700**
JOHN COPE, DIRECTOR, 29 E. MADISON ST., CHICAGO 2, ILL.

JR. FOUNDRY METALLURGIST
$7,200 TO $8,400

Promotable type young man to join rapidly expanding organization that places a great deal of emphasis on engineering proficiency. Client pays fee. Contact Bill Newell in confidence.

MONARCH PERSONNEL
28 EAST JACKSON BLVD.
CHICAGO 4, ILLINOIS

FLOOR MOLDING FOREMAN
$7,200 TO 9,000

Progressive organization seeking promotable type man, who can assume complete departmental supervision. Client pays all expenses. Contact Bill Newell in confidence.

MONARCH PERSONNEL
28 EAST JACKSON BLVD., CHICAGO 4, ILL.

• REPRESENTATIVES WANTED

HIGH ALLOY CASTINGS

Technical representation for sale of quality high alloy castings desired by established midwest foundry. All A.C.I. heat and corrosion resistant grades available to 1500 pounds. Expansion of facilities creates opportunity to broaden market area and opens exclusive territories in midwest, south and east. Engineering and technical background required for consideration.

Our skilled operating staff and fine physical plant insure close quality control. Your reply should include area of operation and lines now represented.

BOX 442, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

DEALERS, AGENTS—WANTED

Blasting Equipment (Wet, Dry), Supplies, Accessories. Choice Atlantic, Southern, Midwestern areas. Indicate coverage and products. Complete details—first letter. Address: Box 428, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY EQUIPMENT SALESMAN

National manufacturer seeks qualified salesman to call on foundries and sell core blowing and resin coating machines and materials handling equipment. Must be willing to travel and be experienced in calling on foundries. Kindly send complete resume or write for appointment.

BOX 431, FOUNDRY
PENTON BLDG., CLEVELAND 13, OHIO

SALESMAN

To sell foundry equipment and supplies for foundry supply house. Territory Illinois and Indiana. Car furnished. Send full resume to: Box 426, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

REPRESENTATIVES WANTED

A large jobbing and semi-production nonferrous castings foundry in lower Michigan is seeking sales representation in the following areas: Chicago, Cleveland, Milwaukee, South Bend, Rockford, Peoria and Grand Rapids. We can produce very large as well as small high quality castings in aluminum, brass, bronze, copper and kirksite. Address: Box 423, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES REPRESENTATION

For Todd Thermo Hot Blast Cupola Air Heaters and Portable Mold and Core Dryers
Regional or State territories available
Address In Confidence to
Mr. M. E. Prowler, Sales Manager Products Div.
TODD SHIPYARDS CORP.
Columbia and Halleck Sts. Brooklyn 31, N. Y.

• ACCOUNTS WANTED

ATTENTION
GRAY IRON FOUNDRIES

Wonderful opportunity for you to expand your sales by furnishing gray iron castings (Loaders, Weights) for lamp and lighting fixture industry. Tremendous following and wholesale contacts. Large Eastern distribution.

FOR FURTHER INFORMATION WRITE:
BOX 904
1501 BROADWAY NEW YORK 36, NEW YORK

• CONSULTANTS

FOUNDRY CONSULTANT—NONFERROUS

Sand casting—permanent mold casting—centrifugal castings—in aluminum, brasses, bronzes, 30% leaded bronze—aircraft quality bearings and castings. Address: ED JENKINS, West Palm Beach, Florida. PHONE: TEMPLE 2-8685.

• WANTED-TO-BUY

WANTED

1000#—2000# capacity Reverberatory Furnace for Iron
Centrifugal Casting Machine to cast up to 10" O.D. x 30" Lg.

BOX 441, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

MIXER WANTED

Used Simpson Intensive Sand Mixers, State size, condition and lowest cash price for immediate acceptance. Address: Box 412, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WANTED

Used Universal Sand Strength Machine. Late model. Address: Box 416, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• FOUNDRIES FOR SALE

FOUNDRY FOR SALE

Fully equipped now operating gray iron foundry in Western New York State for sale at great sacrifice. Reason for selling, present owners want to retire and settle an estate.

BOX 433, FOUNDRY
PENTON BLDG., CLEVELAND 13, OHIO

ALUMINUM FOUNDRY FOR SALE

Once in a Life Time Buy
8000 Sq. Ft.—Bldg. Rents $250.00/mo.
Business priced to sell.
Complete Sand and Permanent Mold.
Located Southeast
BOX 435, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

• FOR SALE

FOR SALE

One Pangborn #180, Type RD-5 Rotoblast Barrel in good condition. Can be inspected in operation. Over $4,000 in spare parts included in sale price. Address: ATOM STEEL, INC., Olmsted Falls, Ohio. ADams 5-3386.

• FOR SALE

FOR SALE

1—Simpson #0 Muller—Style M (never used)

1—Simpson 18" Muller

1—Lancaster Mixer, Model EGB-4

1—Lancaster Mixer, Model EAG-3

3—Link Belt Roto Louver Rotary Dryers, Models 207-10, 310-16 and 604-20.

R. GELB & SONS, INC.
U. S. HIGHWAY 22, RAHWAY VALLEY R. R. UNION, NEW JERSEY

FOR SALE

Result of Government Contract Termination

1—Pangborn Sand Blast, Model N/A Ser. GLG 145137, AUX Table 6' x 25"

3—Pangborn Sand Blast Cabinets No. 53, Type HW-2

1—G. E. Model OX-250 X-Ray Machine Ser. 474205

1—P-K 30 Cu. Ft. Shell Blender

6—Marschke H8-180 Abrasive Grinders and Polishers

200 ft. Richard Wilcox Zig Zag Conveyor No. 2035, all in like new condition

CONTACT . . . . . IRVING GLAZER
MIDWEST ASSOCIATES, INC.
BOX 819 ANDERSON, INDIANA
PHONE 7713

REPAIR AND REBUILDING SERVICE ON ALL PNEUMATIC TOOLS

We try to carry a complete line of "Hard Chrome Rebuilt Tools" at about half the cost of new tools. Before you discard your old tools, why not send them to us for our estimate on the cost of renewing them with our Hard Chrome Process?

CENTRAL PNEUMATIC SERVICE, INC.
512 LINDEN AVENUE
DAYTON 3, OHIO
PHONE: CL 2-2701

FOR SALE

1 #14 Type "GK2" Pangborn Blast Rocker Barrel-Serial #4310 with "FN" Loader and many spare parts. Good working condition.

THE ATLANTIC FOUNDRY COMPANY
AKRON, OHIO JE 5-3345

FOR SALE

1 B & P Mulbaro, with automatic cycling unit and 2 barrows, 2 years old

1 BLYSTONE MIXER, complete, 300# capacity

1 SLY Tumbling Mill, 36 x 60 with Master electric drive and brake

MEECH FOUNDRY, INC.
9906 MEECH AVE. CLEVELAND 5, OHIO
MICHIGAN 1-5550

FOR SALE

OUTSTANDING VALUES!

THERMOLAB (Dietert) Small Size, used only for experimental purposes.

WHEELABRATOR 48" x 72" w/Skip Loader and Dust Collector . . . . good buy.

OSBORN #559 Jolt Pin-Lift . . . never used.

#30 B & P SPEEDMULLOR, Used only a few months.

W. O. McMAHON
P. O. BOX 5799 HOMEWOOD STATION
BIRMINGHAM 9, ALABAMA
PHONES: TREMONT 1-2088 AND 9-6170

• FOR SALE

FOUNDRY EQUIPMENT
FOR SALE
at sacrifice prices!

FORMERLY PROPERTY OF E. W. BLISS COMPANY

TINIUS OLSEN Impact Tension & Cantilever Type Impact Tester; cap. 120 foot lbs.; with pendulum indicator segment graduated 0 to 120 foot lbs.; both left and right of center. Tyler "ROTAP" Testing Sieve Shaker; table dia. 8⅝"; max. height above table 13½"; M.D. DIETERT Hydr. Sand Tester for lab. use; elec. control; with gauge 0 to 1000. DIETERT Sand Permeability Tester; lab. model; with pressure scale. DIETERT Sand Dryer; lab. model; with timer 1 to 15 min. DIETERT Sand Compactor; lab. model.

PARR Peroxide Bomb Calorimeter; lab. model; 150 V, 60 cy. FAY & EGAN 30" x 96" cc Wood Turning Lathe; Model 243; flat bed ways; M. D. CAREY & HARRIS 26" x 72" cc Wood Turning Lathe; with 3-step cone pulley and counter shaft; headstock; tailstock; hand turning rest. NORTON double end Floor Type Tool Grinder; to take 14" x 2" wheels. BEARDSLEY & PIPER 300 cu. ft. Tract Rolling Sandslinger; 19" head; 3 portable hoppers; 200 cu. ft. cap.; motors & controls. BARTLETT & SNOW Sand Dryer. BEARDSLEY & PIPER Sand Conditioner. SIMPSON 72" Sand Muller. SIMPSON 18" Sand Muller. DEFIANCE 36# Knife Grinder; single pulley belt drive; with tilting blade holder 36" long x 3½" face width.

COME IN!! INSPECT!! BUY!!!

MR. W. O. GIBBONS . . .
FORGE & PRESS COMPANY

c/o E. W. BLISS COMPANY
1420 HASTINGS AVENUE
TOLEDO 7, OHIO
TELEPHONE: JEFFERSON 1-3577

FOR SALE

10 Sets of flasks—24" x 32" x 6" cope x 4" drag, with ¾" pins, 35½" pin centers.

15 Sets of flask—20" x 26" x 7" cope x 6" drag, with ¾" pins, 29½" pin centers.

15 Sets of flasks—20" x 24" x 7" cope x 5" drag, with ¾" pins, 27½" pin centers.

46 Sets of flasks—20" x 24" x 5" cope x 5" drag, with ¾" pins, 27½" pin centers.

One (1) International, 16" x 8", Type PK Jolt Squeeze Strip Molding Machine.

The Molding Machine was used for a period of approximately one year and is in excellent condition.

The 24" x 32" flasks are brand new and the rest of the flasks have been used for a period of approximately a year and a half and are in very good condition.

A. B. CHANCE COMPANY
210 N. ALLEN ST. CENTRALIA, MISSOURI
MR. JOHN J. STAED, MGR. PURCHASING

DEMONSTRATOR FOR SALE

STANDARD 48" VERTICAL TYPE CORE GRINDING MACHINE

with individual dust arresting system . . . . 48" diameter power driven rotary table and direct motor drive to grinding wheel through flexible coupling from the motor to ball bearing mounted spindle in separate housing bolted to sliding head on upright column.

ORIGINAL SELLING PRICE $8150.00

Will sell subject to prior sale for $4000.00. Literature available.

MACHINE PRODUCTS CORPORATION
6771 E. McNICHOLS ROAD
DETROIT 12, MICHIGAN

FOR SALE

Excellent Maintained Equipment Under Power To Fit Most Every Type Foundry. NO REASONABLE OFFER REFUSED.

SANDSLINGER

B/P Motive Jr.—Ser. Mt. 250-5011-2 speed-4" tip 19" Hd—12' Jib Arm, 4' Ram Arm, 3 ft track gauge, w/200 ft. track & cable. (2) 200 cu. ft. tanks

MULLERS

Simpson #3F-UD-Serial 87389-Cap. 4000# Cooling Hood-Rotary Air Nozzles, Air Operated Dampers-Natl. Water and Injection Unit—75 H.P., Mtr. T.E. 3Ph. 220/440. C/W Skip Loader.

Simpson #1-H-UD-W/Natl. Engr. Time Cycle unit. 5 H.P. Mtr. 3Rh-220/440 also Complete W/Skip Loader.

B/P—Model 50A-Serial #50-A-241-5702—Complete W/Dusthood-Air Operated Discharge, Multrol Timer & Control Unit. Mtr. 50 H.P. 220/440 T.E. Complete with Skip Loader.

B/P—Mulbaro #3½—Serial M.B. 3723493, 2½ H.P. Mtr. 220/440—3-Barrows.

AERATOR

Natl. Engr.-Style-C-X-10-C4 Serial E-90311-10 H.P. Mtr. 220/440-3Ph.

CONVEYORS

900 ft. 12" Roller Conveyor. 9" long-Raised Rollers 2⅛" Dia. on 3" Centers, 4" Channel.

(2) Flat Belts—18' lg. on Centers and 20" Wide. (Natl. Engr.) 5 H.P. Mtr. 220/440 W/gr.

(1) Troughing Belt-Conveyor—57' Lg. on Centers and 14" Wide—5 H.P. Mtr. 220/440 W/gr. (Natl. Engr).

(1) Troughing-Belt-Conveyor 25' Long on Centers and 20" Wide. (Natl. Engr.) Equipped w/Dings Magnetic Pulley 15" Dia. x 24" Long—AC/Mtr. & Gear Reduction.

BUCKET ELEVATORS

(2)—Natl. Engr.—39' on Centers—14" x 7" Buckets—7½ H.P. Mtr. 220/440—(Late Model Units—Like New).

SAND STORAGE

(1)—50-Ton Sand Storage-Air Discharge.

(2)—25-Ton Distribution Hopper.

SHAKER & SAND SCREEN

(1)—Hewitt Robins—"Floatex"—Portable Ser. F-667-Style IF-11-Cap. 17 Tons Portable—6' x 10' W/1" x 3" Openings in Deck.

(1)—Rotary-Screen & Lump Breaker—60" Dia x 14' Lg. W/Cooling-Dust Hood—5 H.P. Mtr. 220/440.

SANDBLAST-OR. GRIT ROOM

Pangborn—Type AU-11 Tank—Ser. AU-11-5034. Type BVR-Separator. Dust Collector-Ser. CK-1-5017-Size 215-220/440. Room size 14' Wide x 18' Long x 10' High.

MOLDING MACHINES

(1) International Type JDP Seriel 76739 1200# Cap. 10" Draw (1952).

(1) International Type L Serial 76736 Type L—Size 15.000 x 20" Cyl. Has 20" Draw at 80# Pressure. (Never Used—1952).

(1) International Type J Serial 70408 x 16" Cyl. Cap. 8500# (1951) 72" x 72" Table.

(1) Tabor Portable J.R.P.D. 24" x 12" Draw 40" x 30" Table Cap. 1000# (1950).

CUPOLA BLOWERS

(1) Spencer—Serial 20125-9000 CFM at 32 oz. Pressure—125 H.P. Mtr. 220/440 — Complete W/Electricals — (1957)

(1) Roots Blower—Serial 257792 Size 7 Rotary Pressure. Mtr. 100 H.P. T.E. 220/440 Complete W/Switch Gear (Installed 1956)

FOXBORO UNITS

(1) Air Wt. Controller—Serial 316595 Model 40. 0-32 Oz.

(1) Air Wt. Controller—Serial 162323 Model 10

(1) Stabilog—Serial C-18754 Model 10

(2) Potentiometer Controllers Serial #D-78089—With Thermocouples Serial D-78089—Curve K-222 Model 4043-40

SCALES

(1) Kron Scale—Mfg. Yale Towne 48" x 72" Platform—Cap. 5000#—Incr. 5#

(1) Toledo Scale 843—Model 38-1701 FK Size 48" x 72" Cap. 11,250 Inc. 10#

(1) Kron Scale—Mfg. Yale Towne Crane Type Serial #451836 Cap. 30,000

FLASK

500 Tons—Steel & Cast—Send us your requirements.

AUTOMATIC CLEANING & EQUIPMENT CO.
BOX 1288 WILMINGTON, DELAWARE
MR. STRACKE TEL. OL-8-7808
FOUNDRY AT FRONT AND POPULAR ST.

Circle 880 on Page 53

• FOR SALE

SHELL MOLDING MACHINE

Size 20 x 30, fully automatic
in good condition
priced to sell . . .

WELLS MANUFACTURING COMPANY
MR. J. T. MOORE, 7800 NORTH AUSTIN AVE.
SKOKIE, ILLINOIS

AIR HOIST . . . LIKE NEW
INGERSOLL RAND Model B—1000 Lbs.
List price $655.00. SPECIAL PRICE $275.00
Send for complete 1960 AIR TOOL CATALOG!
U. S. INDUSTRIAL TOOL & SUPPLY CO.
8960 GREENFIELD DETROIT 28, MICHIGAN
PHONE: BROADWAY 3-8318

FOR SALE
MOTOR-GENERATORS
TRANSFORMERS
Unused—Rebuilt
WORLD'S LARGEST INVENTORY
ELECTRIC EQUIPMENT COMPANY
Phone station Collect GLenwood 3-6783
P. O. Box 51 — Rochester 1, New York

• FOR SALE

SAND BLAST EQUIPMENT
SELL—BUY—TRADE
GUARANTEED MACHINES
TERMS: 3 YEARS TO PAY

Specialized Wheelabrators and Pangborns converted to your requirements.

6' LF-14 Pangborn Table	$2200.00
9' LG-14 Pangborn Table	$7000.00
6' Pangborn Swing Table	$6000.00
Pangborn GF2 Pangborn Air bbl.	$ 450.00
Pangborn 53 EN2 Hand cabinet	$ 325.00
Pangborn Auto Peening cabinet	$1100.00
14 LG5 Pangborn Multi-table	$9000.00
48 x 48 Wheelabrator Tumblast	$4000.00
42 x 48 Wheelabrator Tumblast	$2500.00
27 x 36 Wheelabrator Tumblast like new	$4000.00
27 x 36 Wheelabrator Rubber Belt	$3000.00
4' Wheelabrator Table Blast	$2500.00
6' Wheelabrator Table Room	$6000.00
Rumelin 8 x 8 room	$1200.00
Pressure Tanks, all types	$150.00 up
Vapor Blast cabinets	$ 400.00

All types and sizes of Hand cabinets, Dust Collectors, Pressure Tanks, Rooms, Horizontal or Vertical Tumbling Barrels and additional Sand Blast Equipment too numerous to mention.

DIAMOND SALES, INC.
5654 W. JEFFERSON
DETROIT 9, MICHIGAN
VI 3-6750

• FOR SALE

FOR SALE
DIRECT ARC MELTING FURNACES
COMPLETE INSTALLATIONS

LECTROMELT—Size "B" 1000 #/Hr. Rating Door Charge, 500 KVA Transformer 25000 V Primary, Controls, Switchgear and Spares.

LECTROMELT—Size "U" 250 #/Hr. Rating Door Charge, 300 KVA Transformer 25000 V Primary, Controls, Switchgear and Spares.

BOX 419 FOUNDRY
PENTON BLDG., CLEVELAND, 13, O.

FOR SALE
Complete Car Mold Conveyor System, 24 Stations, Sand Preparation Unit, Shake Out, Wet Mill; 2 Cupola Chargers; 2 Bondactor Machines; Bricksaw Machine; 3 Cupola Blowers, Weight Controls, Blast Gates; 36 Osborn Jolt Squeezers, Various Sizes; 2 Osborn Pin Strippers; 4 Redford Cartridge Core Blowers; American Sand Cutter; Jeffrey Sanditioner; 48" x 42" Wheelabrator; 125 Fisher Tilting Oil Furnace; Coleman Tower Oven, Gas. All In Excellent Condition. Address: Box 451, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

EUCLID FOUNDRY & MACHINE EQUIPMENT CO.

14919 SARANAC ROAD **CLEVELAND 10, OHIO**

WHEELABRATORS
3—6 cu. ft. Continuous Tumblast
1—42" x 48", 17½ cu. ft. Tumblast with loader
1—36" x 42", 11½ cu. ft. Tumblast
1—6' Table Airblast w/six aux. tables
2—6' Table Pangborn LF and LE

MULLERS
Simpsons # 1, 1½, 2, 3, unit drive
Clearfield #404, 610
Beardsley-Piper #40, 50

LADLES-WHITING
4—25 Tons
2—15 Tons
2—10 Tons

CORE OVEN
1—Di-Electric Model M800-A
Thermonic, 30 KW

SANDSLINGERS
1—B-P 22" head stationary, R&L arm
1—B-P 19" head stationary, double belt
1—B-P 19" stationary, riddle type

WANTED!
COMPLETE FOUNDRIES,
SMALL/LARGE.
PROMPT SERVICE.

— **GLENVILLE 1-1222**

Circle 870 on Page 53

CLASSIFIED ADVERTISING RATES

(Effective Jan. 1, 1960)

POSITION WANTED—Minimum advertisement set solid.
30 words or less $4.00
Additional words ..... 15c each.

ALL OTHERS—Help Wanted, Employment Service, Wanted-To-Buy, Representatives Wanted, For Sale etc. minimum advertisement set solid,
30 words or less $10.00
Additional words ..... 35c each.

NOTE: If replies are to be sent to a box number in care of FOUNDRY, add 8 words to your advertisement for box number and address.

Any advertisement set in all capital letters, add 50% to the above rates.

Classified forms close the 13th of month preceding issue.

FOUNDRY
PENTON BUILDING **CLEVELAND 13, OHIO**

INCH RATES PER INSERTION

Single Column 2¼" Wide	One Time	Three Times	Six Times	Nine Times	Twelve Times
1 inch	$ 27.75	$ 26.25	$ 24.75	$ 24.00	$ 23.25
2 inches	54.00	51.00	48.00	46.50	45.00
3 inches	78.75	74.25	69.75	67.50	65.25
4 inches	102.00	96.00	90.00	87.00	84.00
5 inches	123.75	116.25	108.75	105.00	101.25
6 inches	144.00	135.00	126.00	121.50	117.00
7 inches	162.75	152.25	141.75	136.50	131.25
8 inches	180.00	168.00	156.00	150.00	144.00
9 inches	195.75	182.25	168.75	162.00	155.25
10 inches (1 col.)	210.00	195.00	180.00	172.50	165.00
15 inches (1/2 page)	303.75	281.25	258.75	247.50	236.25
20 inches (2/3 page)	390.00	360.00	330.00	315.00	300.00
30 inches (1 page)	562.50	517.50	472.50	450.00	427.50

Remittance should accompany advertisement when submitted —Cash Discount 2%, 10 days.

AAA MACHINERY & EQUIPMENT CO.

over 1000 satisfied customers

WORLD'S LARGEST INVENTORY OF GUARANTEED FOUNDRY EQUIPMENT

EXCEPTIONALLY POPULAR ITEMS AT REALISTIC PRICES

SAND MULLERS

2—BEARDSLEY & PIPER, Speedmullors, Model 80, Cap.—24 cu. ft. Pan diameter 8'-6". W/air operated batch hopper, water meter, dust hood, 15 HP Clarage cooling fan, Multramatic control, 125 HP Motor. Serial #80-61 & 80-60.
4—SIMPSON Sand Mullers, Model 3½-UD. Pan diameter 9'-3", crib depth 42". Unit Drive. Muller wheels 5500# weight, 45" diameter, 13" face. Capacity 45 to 50 cu. ft., 75-ton per hour. With 75 HP.

3—B & P No. 80 Speed Muller—24 cu. ft. air cooled.
1—B&P #30 Speedmullor, 4 cu. ft., w/skip Hoist Loader—Air Cooled.
1—B&P #60 Speedmullor, 12 cu. ft., w/skip Hoist Loader—Air Cooled.
1—B & P #70 Speedmullor, 18 cu. ft. w/loader.
1—BESSER Paddle Type, 30 cu. ft.
2—CLEARFIELD No. 610 w/skip hoist loaders, 10 to 14 cu. ft. batch.
1—CLEARFIELD #404, 4 cu. ft. batch.
1—DRAVO-DOYLE 6 cu. ft. cap, Port.
1—LINK-BELT 48" x 8' Paddle Type.
2—MASTER 300# Shell Type 5' pan dia.
1—SIMPSON #1-H Style UD, 400# batch.
2—SIMPSON #1½ style UD, 700# w/loader.
2—SIMPSON #2, Style C, 1500# w/loader.
3—SIMPSON #3, Style C, 3000 lb.
1—SIMPSON #3, Style UD, 3000 lb.
2—Mixer Muller, 6 cu ft paddle type.
1—LANCASTER No. EDG-4, 5 cu. ft.
1—LANCASTER #EA-4, 6 cu. ft. w/loader.

AIR & ELECTRIC HOISTS

85—I & R Air Motor type, sizes A, B, C, D, D-6 & E, ½, 1, 2, 3 & 5 ton.
15—DETROIT Air Hoists, 1, 1½, 5 ton cap.
1—DETROIT Model LHR, 5 ton, elec.
20—THOR air hoists, ¼, 1 & 2 ton cap.

BUCKET ELEVATORS

12—LINK-BELT & JEFFREY, 30, 40, 50, 60 ft. ec, 10 x 7, 12 x 7, 14 x 7, 16 x 8 buckets.

CUT-OFF MACHINES

1—TABOR C10AF, 16" wheel, 10 HP.
3—TESSEMER H & I Sprue Cutters.

CORE BLOWERS

3—CHAMPION Model CB-10, CB-18, & CB-400. From 10 to 300 lb. Cores.
22—DEMMLER #50 Model 1, 1E, 2, 2E, 2K, 3, 3E, 3K, 4 & 4E. 10 to 100 lb.
1—FEDERAL 40P-1 San-Sio.
7—INTERNATIONAL Model SB-11 & SB-13, SB-15H, 15 to 30 lb. Cores.
6—OSBORN Nos. 91, 92, 192 and 193. From 10 lb. to 75 lb. Cores.
2—REDFORD #2—Magazine type.
1—SAN-BLO Model CB-40-B, 40# Cores.
1—SPO Model SC-10-DM, hollow core.

CORE OVENS

1—INDUSTRIAL "Revolving Carriers" continuous, 18" x 50" trays.
1—DESPATCH Type "S" 6' w x 16½' l x 7¼' h Oil Fired.
1—THERMONIC Model M800A Dielectric. Cap. 900#s per hour.

CUPOLAS, BLOWERS & EQUIP.

1—SPENCER 150 HP 7500 CFM 48 oz.
6—I & R Centrifugal 30, 50, 85 and 100 HP 3500 to 10,500 CFM w/blast gates.
1—CUPOLA Bondactor, style 1206-L.

ROTO-CLONES WET TYPE

9—AMERICAN AIR FILTER Type N&W. Sizes No. 20, 24, 27, & No. 30, w/sludge ejectors, cap. to 30.000 CFM.

ELECTRIC MELTING FURNACES

4—DETROIT LFA, 350# Cold Charge 700# Molten w/200 KVA transformers.
1—TOCCO 20 KW Induction, 9600 cycles.
3—AJAX No. 100 & 300 Furnaces Only.
6—AJAX 35 KW Induction 460 V 1 phase.
1—DETROIT Size CM—4000# Charge, 3000# Molten, w/1000 KVA trans.
2—AJAX 20 KW Hi Frequency Converters.

GAS & OIL FIRED FURNACES

23—LINDBERG FISHER Model MNP electric Tilt. Sizes 150, 400, 600, 1000, 1700, 2000 & 2400#, alum. cap. Gas or Oil.
29—LINDBERG & HAUSFELD Stationary, Sizes 100, 150, 200 & 550 cap.
1—SKLEENAR 1200# Rev., hand tilt.
1—MONARCH 600# Rev., hand tilt.
1—STROMAN, "U" 600# Reverb.
1—STROMAN DC "Dipout" 800# cap.
1—ECLIPSE E1000—Double Chamber Dry Hearth 1000# cap.

GRINDERS

Swing Frame
1—FOX #4 Wheel 24" x 3"—20 HP.
1—MARSCHKE 20" x 10" wheel, 10 HP.
3—MARSCHKE 24" x 3" wheel, 15 HP.
2—U. S. ELEC. Model 24, wheel 24" x 3".
1—MUMMERT-DIXON #2420, wheel 24".

Snagging
4—FOX #7—30" x 3" Wheel, 15 HP.
2—U. S. #64, 20" x 3", 7½ HP, 4 speed.
2—SAFETY #174, 24" x 3" wheel, 10 HP.
2—MARSCHKE 24" x 4" wheel, 20 HP.
1—U. S. #65, 30" x 3", 15 HP, 4 Speed.
U. S. No. 62V8, 24" wheel, 2-7½ HP motor, variable speed.

Core
2—MILWAUKEE 70-12, 70" dia. table.
1—STONEY Core Grinder, 16" dia. Wheel.

Horizontal Disc
GARDNER No. 124—53" wheel, 20 HP.
GARDNER No. 179, 70" dia. wheel, 40 HP.

LADLES

17—MODERN & WHITING Cylindrical Ladles, 275, 2450, & 3000 lbs. capacity.
37—MODERN & WHITING Lip Pour, Enclosed Gear, 1200, 1600, 2000, 4000, 6000, 7000, 8000 lbs. capacity.
7—MODERN & WHITING Mixing Ladles, 2 & 3 ton. Electric & Manual Tilting.

MOLDING MACHINES

Jolt Squeezers
12—OSBORN No. 275-J—17x20 Table, 10".
2—OSBORN No. 216-PJ—21-32 Table, 16".
6—MILWAUKEE 123—17x26 Table, 12".
2—MILWAUKEE 181—24x36 Table, 18".
10—INT. PVJS—20x26 Table, 12" cyl.
9—SPO No. 110-J—17" x 20" Table, 10".
8—SPO No. 113-J—17" x 26" Table, 13".

Plain Jolt
1—J&J 50" x 72" table—5000# cap.
2—OSBORN 60" x 72" table, 6000# cap.
1—TABOR 36" x 36" table, 1000# cap.

Jolt Rollover Pattern Draw
1—DAVENPORT 28-SA, 29" x 40" table.
2—HERMAN 20" x 30"—750# series.
2—HERMAN 26" x 48"—1500# series.
2—HERMAN 50" x 60"—300# series.
2—HERMAN 40" x 48"—400# series.
1—HERMAN 60" x 84"— 6000# series.
1—HERMAN 60" x 84"—10.000# series.
14—INTERNATIONAL TYPE G., Size 20" x 8", 24" x 10", and 30" x 8".
1—J & J #920 RC—44" x 54"—Hyd. head.
2—J & J #612, 24" x 30" Table.
4— J & J #918, 44" x 54" Table.
1—J & J #815-B, 30" x 40" Table.
1—MILWAUKEE #167, 32" x 33" Table.
10—OSBORN #40 and 42 Core Rollovers.
1—OSBORN #442, 21" x 31" Table.
2—OSBORN #242W, 29" x 42" Table.
12—OSBORN #601 & 602, 30" & 36" Wide Flask, 10" draw, 750 lbs Cap.
2—OSBORN 643 Table 35" x 50"—2000#.
1—SPO No. 917-A—40" x 29" Table.
1—SPO #413D, 24" x 25" Table.
1—SPO Model 508, table size 28" x 30".
1—SPO 5050, Table 25" x 30", 10" draw.
3—TABOR 30" x 40" Table, 12" Draw.
4—TABOR 22" x 42" table, 10" Draw.

Jolt Pin Lift
2—DAVENPORT #34 AJS—36" x 46" Table.
3—INTERNATIONAL JDP 1600 x 10" draw, 36" x 36" Table.
2—INTERNATIONAL JDP 3000# x 10" Draw 48" x 48" table.
1—J & J #812—30" x 38" Table—10".
1—MILWAUKEE #2542—38" x 42" Table.
2—J & J No. 688 25" x 30" table, 6" draw.
2—MILWAUKEE No. 1030—30x38 Table.
1—MILWAUKEE No. 1536 32x38 Table.
3—MILWAUKEE No. 3548—44x48 Table.
1—SPO #3058, 22" x 28" table, 8" draw.
2—SPO #3070, Table 26" x 35", 10" draw.

Jolt Squeeze Pin Lift
1—MILWAUKEE #125, 21" x 27" Table.
3—MILWAUKEE #165, 24" x 30" Table.
3—MILWAUKEE #196, 17" x 38" Table.
1—OSBORN #712-V, 18" x 26" Table.
2—OSBORN #710-J, 17" x 21" Table.
9—OSBORN 714PJ, 20" x 31" Tables.
1—OSBORN #818—24x36 Table, 18" cyl.
1—MILWAUKEE #246—23¼x42 Table.
4—INTERNATIONAL PKL, 17" x 26".
2—INTERNATIONAL #PK-16—20" x 30".
1—SPO #2136—21" x 30" Table—13" Cyl.
2—SPO 2114P, Table 21" x 27", 11" cyl.

Shell Molding
1—SHALCO, Model HO4, 2 station.

SANDSLINGERS

1—BEARDSLEY & PIPER Stationary Sandslinger, Model "DB" 5' jib arm, 4' ramming unit, 19" head, 4" cup, 2-speed motor 25 & 16 HP. Serial #676-5403. New 1955.
1—BEARDSLEY & PIPER Model "DB" Stationary Sandslinger 6' ramming unit, 10' jib arm, 19" head, 4" cup, 2-speed motor 40 & 20 HP W/raising & lowering arms. Serial #8-717-5701. New 1958.
1—BEARDSLEY & PIPER 5-ton Roto-Feed Plate Feeder, New 1958.

2—B & P Swing Type Slingers 19" head.
4—B & P 5 ton plate feeders.
6—B & P Tanks for speed slingers.
1—B & P Motive 15' Jib—6' Ram—19".
1—B & P Motive Jr. 8' Jib—4' Ram—19".

CONVEYORS

Steel Apron
9—JEFFREY & LINK-BELT 24", 30", 36" widths. Lengths built to your specifications, with reducers & motors.

Oscillating & Vibrating
1—LINK-BELT 48" x 154', 20 HP Motor.
7—JEFFREY TAYLOR No. 5 Vibrating Feeders 24" wide x 7'.
LINK-BELT "FLEXMOUNT"
1—8" W x 50' L x 4" deep pan.
2—18" W x 18' L x 4" deep pan.
2—SIMPLICITY 24" W x 13' L x 6" Deep.
1—SIMPLICITY 18" W x 11' L x 6" Deep.
1—SIMPLICITY 24' W x 19' x 6".

Roller
2500' MATHEWS 6". 14" wide, 2⅞" dia. roller, 1½" hex shaft, 4" channel.
1500—MATHEWS 8" wide, 3¼" dia. 1" hex shaft on 6" centers, 6" channel.

Mold
1—DUO-ROLL 88 Cars 20" x 48", 350' track, with automatic dumping.
1—PALMER "B" 106 Cars—42" x 62" w/550' Track.

Belt
LINK-BELT & JEFFREY 18", 24" & 30" wide. Flat or trough idlers, all Timken bearings. Built to your specifications. Can be equipped with molders hoppers & Ploughs.

HOPPERS & STORAGE BINS

2—NATIONAL ENGINEERING "Moulders Helper" 2 Hopper Unit.
7—NATIONAL & LINK-BELT Storage Bins, 60 to 150 tons cap.
1—NEWAYGO HS-7-GT, Handy Sandy.
42—MOLDERS Hoppers 1¼ ton cap.

SAND PREPARATORS

6—B & P Screenerators, Models S, M & L.
8—ROYER, Models, NC-4, NDS, NDP.
6—AMERICAN Sand Cutters, Model M, Sizes 79/60, 89/70, 99/80. All late.
4—AMERICAN Model AA and AM, 45" & 60" Cutting Blade.
1—AMERICAN "Sand Master," 102"/70" Cutting Blade—1952.
2—MOULDERS' FRIEND 50" x 60" Brush.
2—NEWAYGO RS-V Reddy Sandys.
1—BEARDSLEY & PIPER #60.

SHAKEOUTS & SCREENS

2—LINK-BELT 5' x 10'. 6 ton cap.
3—SIMPLICITY 4' x 6' Model B.
1—SIMPLICITY 4' x 8' Model D.
1—SIMPLICITY 4' x 10' Model D.
1—SIMPLICITY 5' x 8' Model D.
1—NATIONAL ENG. 5' x 8' Hex Screen.
1—HEWITT-ROBINS 36" x 75" Vibrex.
1—SIMPLICITY 4' x 10' Model B. Single deck sifter screen, 10 HP motors.
2—ROBBINS 3' x 4' JF6—2000#.
1—ROBBINS 6' x 10' JF11—20.000#.

SAND BLAST EQUIPMENT

2—AMERICAN 34" continuous Tumblasts.
1—AMERICAN 36" x 42", w/skip hoist.
2—AMERICAN 48" x 42", w/skip hoist.
1—AMERICAN 27" x 36", w/skip hoist.
1—AMERICAN 48" x 48", w/skip hoist.
1—AMERICAN 48" x 72" w/loader.
1—AMERICAN No. 2 Tablast — 6' dia.
1—PANGBORN Model 6-CF, 6' diameter plain table with dust collector.
1—PANGBORN 6 LG-14 Multi-Table, 6-24" tables, w/dust collector.
1—PANGBORN Model 14GK-7 Roto-Blast barrel w/loader.
1—PANGBORN 9LG-14 Multi-Table w/6—36" dia. Aux. Tables w/Dust Collector.

AAA MACHINERY & EQUIPMENT CO.

10900 CEDAR ROAD—CLEVELAND 6, OHIO—CALL SW 1-3900

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FOUNDRY ENGINEERING SERVICE

FOUNDRY EQUIPMENT BY FOUNDRYMEN

HAMLIN-NAGEL, INCORPORATED

Box 192, EDWARDSVILLE, ILLINOIS, *In Metropolitan St. Louis,* PHONE 3864

B & P Motive Jr. Sandslinger complete with all accessories, tanks and rail, LATE!

15,000# Plain Stripper for Sandslinger

International AN Rollover Stripper, JDP Jolt Stripper, JJR Double Jolt Machine.

Complete 12 to 20 Station Sand System.

Modern Cupola Swivel Charger.

Three Complete Chemical & Physical Laboratories

Large Capacity Plain Jolters.

Air Blasting Rooms, complete or component parts.

AIR COMPRESSORS

15, 25, 30, 40, 50, 75 & 100 HP water cooled
175 hp synchronous, 2 stage IR-XRE

AIRLESS BLAST EQUIPMENT

Wheelabrator 48 x 72 with skip and dust collector, excellent condition.
American 66" Swing Table 48 x 48 with Skip Hoist

Wheelabrator 27 x 36 with skip
Wheelabrator 42 x 48 with skip & collector
Wheelabrator 36 x 42 with skip & collector
Pangborn #3 continuous with feeder & collector

CORE BLOWERS

Demmler 103EO, skip feeder & automatic cycle
Demmler 3EO, feeder & semi-automatic cycle

SHELL CORE MACHINES

Demmler #1 and 2, #55 and 2K
Champion CB-8 and CB-15 and CB-18
Redford #1 & 2
San Bio CB-40-D-LPP

Complete CO^2 Unit—Shooter Gaser w/Tanks & Mixer

CORE OVENS

Coleman 39' tower combination Oil and Gas
Foundry Equipment Portable Mold Drying Oven
Large Foundry Equipment Mold Drying Oven
Large Porbeck Mold Drying Oven
Porbeck double end Gas or Oil
Porbeck single end Gas or Oil

HEAT TREATING

Lindberg Super Cyclone
Gas Fired 48" Dia x 60"
G.E. 30" Dia x 36" Single Phase

JOLT PIN LIFT

Davenport 34A, 36 x 46 Table
International JDP, 1200# capacity
Milwaukee 1536, 32 x 38 Table

JOLT SQUEEZE PIN LIFT

International PKL14
International PK 18
Milwaukee 125, 126, 145, 193
Osborn 712PJ
SPO 2192 (auto-cycle)

JOLT ROLLOVER DRAW

Herman 40 x 60—10,000#
International F 16" Draw
International G 30 x 12
Johnson & Jennings 918
J & J 815, 30 x 40 Table
SPO 508, 28 x 30 Table
Tabor 30 x 50

JOLT SQUEEZE ROLLOVER DRAW

Osborn 332
SPO 920, 20" sq. cyl.
SPO 413D
SPO 9548

JOLT SQUEEZERS

International PJS-16"
International LJS-10"
International LJS-12"
Milwaukee 103
Osborn 275J and JW
SPO 110J
Tabor Top Squeezers
Champion JB, 10"

MATERIAL HANDLING

Hough HA Payloaders, Forklifts 4000#, 6000#, 7000#, Handling Boxes.
Roura Hoppers.

1¼ yard D. C. Clam Shell
½ and 1 Yard Clamshell Buckets
Hoists Air and Electric, All Sizes
Hough HA Payloaders & Forklift Trucks
Champion CB-8 and CB-15 and CB-18
Crane Magnets 50", 55"

MELTING FERROUS & NONFERROUS

Cupolas 2½, 4, 6, 8, 9, 10
Blowers Foxboro Air Wt. Controllers
Bondactor Mod. 1000
Crucible Furnaces (Stat & Tilt)
Dip out Reverberatory
Lindberg Induction, 180#

METAL HANDLING

Ladles 250#—25,000#
Pouring Devices, various capacities
Motorized Ladle Carrier
12" Cleveland Tramrail

MULLERS

Simpson #3F complete with skip, auto-cycle, cooling hood, etc.
Simpson #2UD with skip
Simpson #1UD, skip, hood, auto-cycle, etc.
Simpson #3 open gear with skip
Simpson #2 open gear with skip
B&P #60—W or W/O multromatic
B&P #50A with skip, Multiroll, hood
Simpson Porto Muller
B&P Mulboro
610 Clearfield

SAND CONDITIONING AND HANDLING

Screenarator S. M. L.
Royer NDP-NC2
American Sand Cutters—various sizes.
Bucket Elevators
Troughing Conveyor 18" x 34' w or w/o magnetic pulley.
Oscillating Conveyor 24" x 30'—year 1956
B & P No. 40 and 60 Preparators

MISCELLANEOUS EQUIPMENT

Sprue Cutter
Grinders, 18" x 24"
Flasks, Steel, various sizes
Flasks, Aluminum Slip
Flasks, Fremont Magnesium Slip
Jackets, Aluminum & Wopper Jaw
Core Plates—Aluminum & Transite 20 hp GE
American Core Rod Straightener
Swing Grinders
15 HP Swing Grinder and Tumbling Barrels, 36" x 72"
458 Chain & Trolleys

42" Bullard "New Era" VTL lathe with side head
52" Betts Boring Mill with two loading arms.
American Radial Drill 14" x 7' Arm

WANTED! GOOD SURPLUS EQUIPMENT . . . . . .

Circle 867 on Page 53

THE ACME BARGAIN PAGE

AIR COMPRESSORS
Binks 2 Stage, 2 h.p.

AERATOR
NEWAYGO

BLOWERS
L-R. 12900 cfm, 100 h.p. 220-440 V, 20 oz.
GE 10500 cfm., 20 oz., 85 h.p., 220 V.
GE 7500 cfm., 20 oz., 89.6 h.p., 220-440 V.
SPENCER 7350 cfm., 16 oz., 50 h.p.
SPENCER 7000 cfm., 32 oz.
GE Centrifugal 6200 cfm., 24 oz., 58 h.p.
SPENCER 3500 cfm, 28 oz., 40 h.p.
SPENCER 2250 cfm., 16 oz., 15 h.p., 220
SPENCER 1350 cfm, 32 oz.
NORTH AMERICAN 1050 cfm, 16 oz.
NORTH AMERICAN 850 cfm.
McKee 200 cfm.

CONVEYOR
17' BARBER GREEN Bucket Conveyor
30" x 25' Magnetic Belt Conveyor w/drives, 2 hp., 220-440 V.
24" x 18' Trough Perm. Magnetic

CONVEYORS OSCILLATING
SIMPLICITY 18" x 24'
SYNTRON 24" x 6'
AJAX 12" x 20'6"
36" x 11', Ajax
8' x 12', Ajax

CORE BLOWERS
CB15 55# cores, Universal blow plate
DEMMLER #4 up to 250# cores
DEMMLER #50
DEMMLER 2EO
DEMMLER 2K
FEDERAL "SAN-BLO" CB 40
INTERNATIONAL SB15H, up to 150# cores. Hydraulic clamp and draw
INTERNATIONAL SB 13, up to 60# cores
6—OSBORN 193 up to 50# cores
REDFORD #2 & #4

CORE GRINDERS
5—MILWAUKEE 70-9 & 70-12s
1—OWOSSO DE1-303 42" table

CORE OVENS
THERMONIC INDUCTION MODEL 1800A
2—Despatch ET. Drawer Type

CORE ROLLOVERS
INTERNATIONAL REDP Rollover 12" draw
SUTTER #500

CRANES
P&H 5 TON Electric Traveling DC motors 50' span
270' Crane Runway and Supports
10 ton MILWAUKEE: 48' span, 220 V.

CUPOLA GUNS
1—Bondactor #1250 and 1000

DUST COLLECTORS
PARSONS 40,000 cfm. cloth bag type
ROTOCLONE W14 Arrang. A, 5200 cfm.

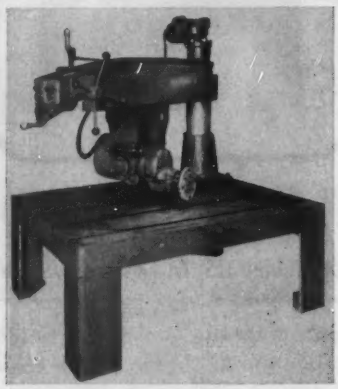
ELECTRIC MELTING FURNACES
1—DETROIT "LFA" 350# shell 13200 V.
1—DETROIT "LFC" 700# and 350# Tapered Shell 2300 V.

FURNACES
400# Fisher Motorized Tilt, Gas Fired
600# Fisher Stationary
600# Campbell Hausfeld Brass
ECLIPSE 2000# Skelnar Gas, cast iron, or alum.

GRINDERS, MISC.
U.S. #70 Comb. 20" disc & 20"x3"x1½" wh
GARDNER 18" single end disc.
HANCHETT 30" double spindle opposed
GARDNER 28" D.E. Disc.
GARDNER 30" D.E. Disc.
72" Gardner Horizontal Disc.
53" Hanchett Horizontal Disc.

GRINDERS, SNAG
Marschke 30" x 3" 3 speed snag
120A GARDNER 30" Opposed Disc
U. S. D.E., 20" x 3" Wheel, 15 h.p.
5—#6 FOX Single Wheel 24" Snag
2—US 30" x 3 25 HP. DE Snag
STANDARD 24 x 2½—15 HP DE Snag

GRINDERS, SWING FRAME
FOX 24" x 3" x 12" 15 h.p.
MARSCHKE 24" x 3" x 12" 20 hp., 220 V.
U.S. 24" x 3" x 12" 15 hp., 220-440 V.
2—MARSCHKE 3 hp., 12" wheel
1—B&D 7½ hp.



DEWALT CUTOFF SAWS for ferrous or nonferrous metals, cutoff or as sprue cutters. Flush blade adaptor takes up to 20" abrasive blade or saw. Power Hoist to arm. Chain & sprocket cross feed for working on heavy cast iron 48" x 60" "T" slot table or off table cutting of large work. Motor swivels horizontal to vertical in yoke.

HEAT TREATING FURNACES
G. E. Elevator type 1950°—Atmosphere Generator 54" x 96" Car. Electric, Late
G. E. Elevator type 2150°—96" x 144" car atmosphere generator, Electric, Late
G. E. Pusher type 1750°
LINDBERG 1250° 48 x 60 Electric
3—ABBOTT 24" H x 22" Deep x 30" Wide, Gas Fired
HOLDEN #202 1850° Bright Hardening Annealing

HOISTS
2—4000# Lo Hed, 220/440V
1—600# INGERSOLL-RAND LC-4
4—CLEVELAND 2000# Cab type hot metal carriers
6000# Cleveland, w/monotractor travel
4—2000# Ingersoll Rand Hoists

INDUCTION MELTING EQUIPMENT
100 KW-Ajax 300# 3000 cycle, 150 h.p. 4 bearings MS set, water cooled, complete controls
30 KW Lepel Spark Gap
35 KW Ajax Tama Wyatt, 60 cycle induction holding furnaces
1000# Ajax Spare Melting Furnaces—Unused

LADLES
WHITING 16000# Crane
WHITING 8000# Crane
WHITING 5000# Crane

LADLE MIXING
4000# Industrial, Insulated

MOLD BLOWER
TACCONE TD4 24" x 32" flask

MOLDING MACHINES
JOLT SQUEEZE PIN LIFT
8—OSBORN 712 PJ 18" x 28" table
1—CHAMPION JSL10P 18" x 21" table 6" draw
8—MILWAUKEE 2646 Jolt Squeeze Strip rolloff — rolling molding machines 10" jolt cylinder; 1800# capacity, 26" Squeeze cylinder; 13" draw, Flask size 25½" to 29" wide, 52" long, FACTORY REBUILT.
2—MILWAUKEE 165, 24" x 30", 8" draw

JOLT SQUEEZERS
4—CHAMPION, JS10P 18" x 21" table
2—OSBORN 275PJ
2—MILWAUKEE 244 Jolt Squeeze car type head
MILWAUKEE 181-7, 24" x 36" table
104 MILWAUKEE
10"—32 Adams
113 PJ SPO
25—124 MILWAUKEE Portable Jolt Squeezer
6—104 MILWAUKEE Portable Jolt Squeezer

JOLT ROLLOVER DRAWS
HERMAN 10000# late
HERMAN 3000#
2—750# HERMAN 20" x 30" table
1—INTERNATIONAL RJ 20" x 12"
1—SPO 9032
3—SPO 506
1—SPO 506 SP
2—INTERNATIONAL G
2—TABOR 30 x 52

JOLT SQUEEZE ROLLOVER DRAW
OSBORN 331-332-333
SPO 413D
INTERNATIONAL RES.

PLAIN JOLT
40" x 84" Herman
36" x 60" Herman
2—20" x 30" INTERNATIONAL

MULLERS and MIXERS
#80 B&P
2—#3 UD Simpson
1—930 Clearfield
CLEARFIELD #404
4—#2 SIMPSON OG
#1 Simpson OG

SAND CONDITIONERS
AMERICAN 51"
JEFFREY SANDITIONER
ROYER NDC—ND2
SCREENARATORS S-M-L

SAWS, BAND
30" LAIDLAW, Metal Cutting hydraulic feed

SHAKEOUTS
3' x 5' SIMPLICITY
3' x 10' SIMPLICITY
5 x 10 LINK BELT
4 x 8 LINK BELT

SHELL EQUIPMENT
SHELL PRODUCTS 20" x 30" pattern size w/shell blender and bonding press
TSM4 Shell Molding Machine 20" x 30"

SHOT BLAST
SLY #4, 20" x 30" w/dust collector

SLAG DISPOSAL UNIT
AMERICAN MODEL A

SPRUE CUTTERS
1—MILWAUKEE #85 TON

STRAIGHTENING PRESS HYDRAULIC
150 ton HPM
150 ton Farquhar "C" Frame
100 ton Watson Stillman "C" Frame
60 ton Lampco 4 post
60 ton Farquhar "C" Frame

TESTING EQUIPMENT
ARLIN Automatic Rockwell, continuous type
COLEMAN 55 Spectrophotometer
GOGAN Model 1414-2V
TINIUS OLSON Brinnel Hardness Tester Production Bench

TUMBLING BARRELS
1—ROYERSFORD, 42" x 72", chain drive
SLY, 24" x 48"; 3 H.P.
SLY, 30" x 60" Duplex.

TUMBLING MILLS
30" x 60"

WHEELABRATORS
27" x 36" American w/skip
48" x 48" AMERICAN w/skip
6' Table PANGBORN
#1 Rotary Table, AMERICAN
20" x 27" AMERICAN, w/rubber belt
AMERICAN #2 Tabiast 8-2½" tables, late
PANGBORN GD1-Airblast Barrel

WOODWORKING—PATTERNSHOP
GARDNER 30" DISC and Spindle Sander
HERMANCE 24" Planer
JONES SUPERIOR 48" Double Disc
OLIVER #290 Dbl Arbor, Tilt-Arbor Saw
1—OLIVER 162D, 15' Disc Sanders
WALLACE 8" Jointer
CRESCENT 24" Planer
ONSRUD W-244 & W-240 Routers
8", 12" and 30" Jointers

ACME

ACME EQUIPMENT CO., INC.

We will buy for cash a single piece of equipment or your entire plant

126 South Clinton Street • Phone: ANdover 3-3430 • Chicago 6, Illinois

MONA

Two *OUTSTANDING VALUES* from UNIVERSAL

BLAST CLEANING UNIT

. 96" WHEELABRATOR SWING TABLE

Capable of handling work 96" in diameter. 42" work height clearance, 10,000 lb. loads.

LIKE NEW CONDITION—SEE IN OPERATION.
Less Than Half of Today's Replacement Value.

BEARDSLEY & PIPER—2 Speed

MOTIVE JR. SANDSLINGER

Complete with spare parts.
4" tip, 19" head, 11' jib arm, 4' ram arm.
7 to 10 cu. ft. per minute ramming capacity, 3' track gauge, 200 cu. ft. tank capacity.

Located in our warehouse.
PRICED EXCEPTIONALLY LOW!
Write or Phone for Inspection.

PARTIAL LISTING OF OUR REGULAR REBUILT MACHINERY STOCK

AIR COMPRESSORS
1—15 hp WESTINGHOUSE air cooled, 2 stage
1—75 hp INGERSOLL-RAND water cooled, horizontal
1—100 hp WORTHINGTON air cooled, 2 stage

BLOWERS
25—CENTRIFUGAL 16 oz., 2 to 5 HP
10—GE, WILBRAHAM - GREEN, FISHER Positive Pressure & Cent. Cupola Blowers

CLEANING EQUIPMENT & TUMBLING BARRELS
1—15" Cont. WHEELABRATOR Tumblast
1—26" Cont. WHEELABRATOR Tumblast
1—20" x 27" WHEELABRATOR Tumblast
1—27" x 36" WHEELABRATOR Tumblast
1—36" x 42" WHEELABRATOR Tumblast
1—48" x 42" WHEELABRATOR Tumblast
1—48" x 48" WHEELABRATOR Tumblast
1—48" WHEELABRATOR Swing Table
1—96" WHEELABRATOR Swing Table
1—1-A WHEELABRATOR Multi-table
1—WHEELABRATOR Peening Cabinet
1—WHEELABRATOR "K" Pressure Cabinet
1—PANGBORN TABLAST, 8' Table
1—PANGBORN Air Blast Room
1—PANGBORN PIPE CLEANING CABINET
1—SLY, 68" x 32" Round
4—SLY, 48" x 36" Round

CONVEYORS
1—HEWITT-ROBINS Oscillating, 18" W x 40' L
1—HEWITT-ROBBINS Vibrating, 18" W x 10' L, Model VC-I
1—LINK-BELT, CAR type mold, 114 cars, 403' track, car size 18" x 42"
1—SIMPLICITY, 24" x 10" Feeder w/hopper, Model OA-10-JA2

CORE BLOWERS
10—DEMMLER #1, #2, #2A, #3K, #4E
3—INTERNATIONAL SB-13
3—OSBORN #91, #192, #91-10
1—RANDALL MODEL "A," Bench Type
1—SAN-BLO #40-P-1, 40# core
1—TACCONE #4D, 10" Draw Stroke Cyl.

DUST COLLECTORS
COMPLETE STOCK—both Wet & Bag Types

FURNACES—DIRECT ARC MELTING
1—250 lb. LECTROMELT, Side Charge
1—500 lb. LECTROMELT, 200 KVA trans.
1—1000 lb. SWINDELL
1—2000 lb. HEROULT
1—2000 lb. SWINDELL, 3/60 1000 KVA.
1—1½ Ton HEROULT
1—11' LECTROMELT Top Charge
1—12' SWINDELL Hyd. Top Charge

FURNACES—INDIRECT ARC
1—10# DETROIT
1—350# DETROIT LFA
1—750# DETROIT LFY, Conical Shell
1—1000# DETROIT AAD P, 300 KVA
1—3000# DETROIT C, 500 KVA

FURNACES—INDUCTION MELTING & HEATING
1—30 KW ECCO Hi-freq. Vacuum Melting
1—35 KVA AJAX 60 cy., alum.
1—35 KVA, AJAX SPARK GAP, High Freq., steel
1—30 KW LEPEL water cooled spark gap

FURNACES—GAS & OIL
1—1000# HAUSFELD hand tilt, Oil fired, alum or magnesium
1—1 #900 JC STROMAN, gas. Like new
1—6000# STROMAN, gas Fired

FURNACES—HEAT TREAT
1—4' x 4' x 10' Gas Fired Annealing
1—9' x 12' Car Type, gas/oil
1—210 KW LINDBERG conveyor box type
1—7' Rotary G.E., 200 KW, 1950° F
1—36" x 36" WESTINGHOUSE Pit Type.

1957 NATIONAL ENGINEERING
Sand Handling System
Complete in every respect—LIKE NEW
Save Over 50%—Write For Details.

MOLDING MACHINES
Jolt Rollover Pattern Draw

2—DAVENPORT #34SA w/air clamps, 34" x 48" table, 2500#
2—DAVENPORT #40SA, 40" x 60" table, 3000#
1—HERMAN 10,000#, 48" x 109" table
1—HERMAN 6000#, 42" x 78"
2—HERMAN 7500#, 40" x 50" tables
1—HERMAN 7500#, 40" x 60" table
1—HERMAN 3000#, 30" x 66" table
1—HERMAN 3000#, 32" x 70", 15" cyl. series charging conveyor type
5—HERMAN 1500# to 30" x 48" tables
1—INTERNATIONAL 30" x 12", Type G, 28" x 35" table
2—INTERNATIONAL, 13" x 17" tables
1—OSBORN #602, 36" x 26", 900#
1—OSBORN #405, 3000#, flask 64" x 57"
4—TABOR 40" x 60", 1500 & 3000#
2—TABOR 30" x 40" w/air clamps, 1000#
1—TABOR 22" x 42", pattern draw, shockless, portable, 600#
1—TABOR 20" x 30", w/air clamps, 1000#
2—TABOR 14" x 16" Rockover 150#
1—TABOR 40" x 50" table, 3000# capacity

Plain Jolt

1—INTERNATIONAL, 3' x 4' table, 12" cylinder

Jolt Pin Lift

1—HERMAN #4317, 22" x 30" table
2—INTERNATIONAL JDP, 1200 x 8", 24" x 26" table, 8" draw, 1200#, port.
1—OSBORN #559, 25" x 30" table, 6" draw, 1200#
2—SPO #305, 750 lb., 20" x 27" table
1—TABOR 20" x 24" table, 600#

Jolt Squeeze Pin Lift

2—INTERNATIONAL PKL, 20" x 28" table, 14" sq. 5½" draw
2—INTERNATIONAL, PKL, 18" x 24" table, 12" sq., 5½" draw, stat.
2—MILWAUKEE #163, 15" x 24" table, 11" sq., 1500#
1—NICHOLLS 18-44, 6¼" draw.
5—OSBORN #712J, #712PJ, 18" x 28" table, 12" sq., 6" draw, stat. & port.
2—OSBORN #716PJ, 22" x 34" table, 16" sq., 8" draw
5—SPO #2114P, 21" x 27" table, 600#
2—SPO #2116, 21" x 27" table, 11" sq., 6" draw

Jolt Squeezers

2—INTERNATIONAL #12 LJS, 16" x 20"
4—INTERNATIONAL #10 LJS, 16" x 20"
10—OSBORN #275J, 16 x 20" table, 400#
3—TABOR Squeeze-in Head, 16" x 19" table
1—TABOR Yoke Type, 18" x 26" table

MATERIALS HANDLING
1—BYERS, Mobile Crane, BUDA Engine, 50' Boom, 5 ton w/magnet & bucket
1—HOUGH PAYLOADER, Model HA, 1000# cap., hyd. lift, mech. dump

MULLERS AND MIXERS
1—B&P #30 Speedmuller w/skip, 3 cu. ft.
1—B&P #40 Speedmuller w/skip, 5 cu. ft.
1—B&P #50 Speedmuller with cooling & multro-matic controls, 7½ cu. ft.
1—B & P, Conventional, SIMPSON type, 87½" Dia. arranged for cooling
1—SIMPSON #0, U.D., 3' Dia
1—SIMPSON #1, U.D., 4' dia., 4 cu. ft.
1—SIMPSON #1½, U.D., 4'6" dia., 6 cu. ft.
1—SIMPSON #1½, Sep. Dr., 4'6" dia., 6 cu. ft.
1—SIMPSON #2, enc. gear, 6', Dia. 14 cu. ft.
2—SIMPSON #3, 8' Dia. Sep. Dr., 20-25 Cu. Ft. Batch

LADLES
Bottom Pour

4—MODERN, 49" x 49"
2—MODERN Crane Type, 55" H x 50" top
1—MODERN Crane Type, 60" H x 60" top

Lip Pour

1—WHITING 52" x 52" top dia. geared

Cylindrical

8—WHITING, 26" L x 25" dia, 1100# iron
7—WHITING, 19" L x 22" dia, 600# iron
3—WHITING, 38" L x 28" dia, 2200# iron

OVENS
1—COLEMAN, Gas, 2 Comp. and 5 drawers, O.D. 22" x 12' x 10'
3—GENRICH, Elec. elevator type,
1—LANLY, elec. 5'11" x 3'2" x 7'3" H

SAND CONDITIONING
1—AMERICAN Sand Cutter, Model AA, 62" cutting reel
1—B & P Nite-Gang
2—B&P Screenarator, Model "M"
1—LINK-BELT Revivifier
1—MOULDER'S FRIEND, 50" cutting reel
1—ROYER Jr., 7-10 tons/hr., ¼ Hp
2—ROYER, NC-2, 10-15 tons/hr, 1½ HP
1—ROYER NC-4, 10-15 tons/hr. 1½ Hp
1—ROYER PREPARATOR, Comb. Model NDC, 25 ton/hr scrap removal, 8' x 8' hopper
3—ROYERS, NDP, 15-25 tons/hr, 2 Hp
1—SIMPLICITY Type SOBG, 4' x 5' screen
6—SIMPLICITY Shakeouts, 3'x10', 4'x8', 4'x10', 5'x8'

SAND SLINGERS
1—B&P Motive Jr., 2 speed, 19" head, 4" tip, complete
1—B&P Stationary, 2 speed, 19" head, 4" tip with plate feeder
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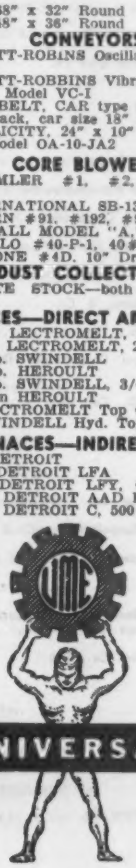

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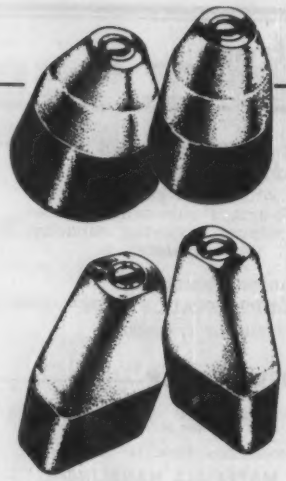

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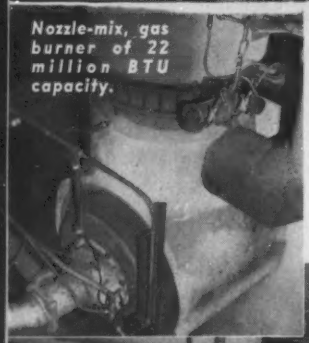
MODERN WATER-COOLED CUPOLA OPERATION . . .

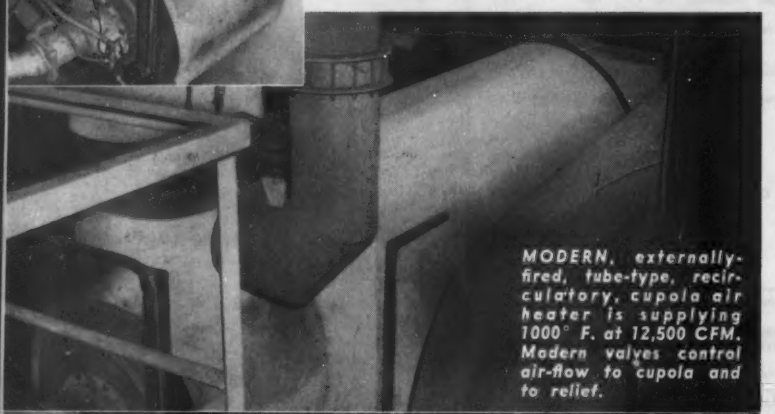


Nozzle-mix, gas burner of 22 million BTU capacity.

Modern, #96 W-C, water-cooled cupola is 96" dia. in the carbon-lined, offset well. Cupola is fired by 1000° F. Modern heater. Melting progresses continuously; 5 days a week and 24 hours daily.

EFFICIENCY BOOSTED BY 1000° F. RECIRCULATORY HEATER . . .

Again, the nation's melting costs are boiling down! NOW, MODERN, economical and highly flexible water-cooled cupolas are fired by new, MODERN, recirculatory, hot-blast heaters:



MODERN, externally-fired, tube-type, recirculatory, cupola air heater is supplying 1000° F. at 12,500 CFM. Modern valves control air-flow to cupola and to relief.

Back of #96 W-C, MODERN cupola. Master control panel at left.

Blast air, to 1000° F. and in volumes to 12,500 CFM is helping to cut coke ratios while producing better metal, for ingot-molds, at Vulcan Mold & Iron Company, Lansing, Illinois. Among the major advantages, as gained at Vulcan are:

- Flexibility and fine control over melting processes . . .
- Prolonged periods of melting without dropping bottom . . .
- Decreased costs for coke, refractory and maintenance . . .

Melting, at Vulcan Mold & Iron Company, progresses continuously from Monday morning until Friday night. All these and other benefits are covered in new bulletin 149-A.

MODERN

Dept. F-7

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75th ANNIVERSARY

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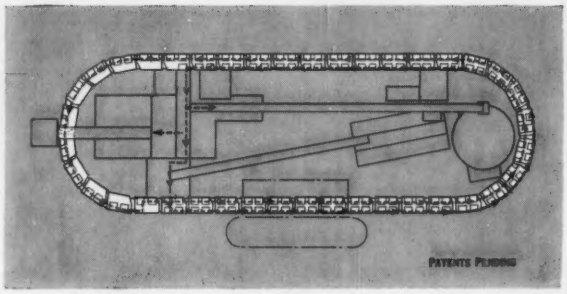
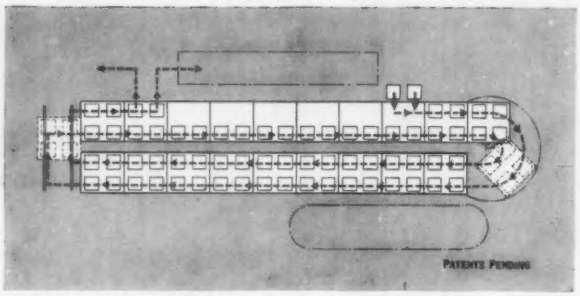
"Double MLC" Mold Handling System

Snap or tight flask molds are set out in outside position on the car, poured, and travel almost completely around the loop. They are then transferred automatically to inside position on the car, and continue around the loop again for automatic removal at the shakeout. These new systems provide almost twice the cooling time of a conventional mold conveyor carrying only a single line of molds; effecting substantial savings in floor space, equipment, building, and other facilities.



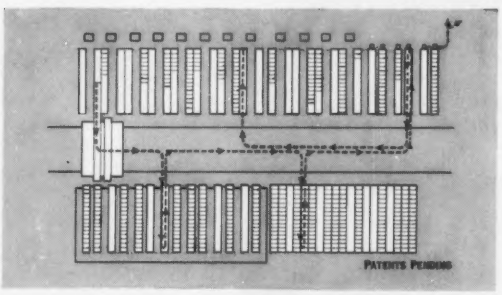


"Double MRI" Mold Handling System

Rectangular loop, consisting of two straight runs connected with a rotary turn and transfer car. Cars advance one car length, then remain stationary for timed period so large molds can be loaded onto the conveyor, poured, and the molds removed, while the conveyor is stationary. Molds are carried side by side on the cars and make almost two complete trips around the loop, thus nearly doubling the cooling time per square foot of floor space.

"MF" Mold Handling System

Unlimited flexibility for jobbing foundries. The transfer car delivers pallets loaded with similar molds, to the pouring, cooling, and shakeout zones, and returns the pallet with the bottom boards and bands—or flasks—to the molding area. Handling similar molds together permits molds for different castings to be kept separate, and even poured with different metals, without interfering with other groups of castings. Slow jobs do not hold up the fast jobs. Molding, pouring, cooling and shakeout are centralized, minimizing the equipment requirement.



Write today for a copy of Bulletin No. 135. It gives full details about eight different types of Bartlett-Snow Mold Handling Systems.

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